

Telit

GE864-QUAD,

GE864-PY,

GC864-QUAD,

GC864-PY

Product Description

Telit Communications S.p.a. 2006

This document is relating to the following products:

Model	P/N
GE864-QUAD	3990250651
GE864-PY	3990250650
GC864-QUAD	3990250675
GC864-PY	3990250676
GE864-PY Interface	3990250672

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1 Overview

The [Telit GE864](#) and [GC864 modules](#) are small, lightweight, low power consumption and RoHS compliant devices that allow digital communication services wherever a GSM 850, 900, DCS 1800 or PCS 1900 network is present.

The [GE864](#) is a low cost connector-less best solution for medium to high quantity projects.

The [GC864](#) is provided with a 80 pin Molex board to board connector and a 50 Ohm Murata RF connector.

The [GE864-PY](#) and [GC864-PY](#) models integrate the “**EASY SCRIPT**” on top of all other features of the [GE864-QUAD](#) and [GC864-QUAD](#). The PYTHON, is an engine script interpreter, allowing self controlled operations. With the **EASY SCRIPT** feature the [GE864-PY](#) and [GC864-PY](#) become a finite product, they just needs your script to be run.

All [GE864](#) and [GC864](#) models includes all state-of-the-art features like GPRS Class 10, Voice, Circuit Switched Data transfer, Fax, Phonebook and SMS support, ‘EASY GPRS’ embedded TCP/IP stack and ‘EASY CAMERA’ external camera support and battery charging capabilities.

The [GE864](#) and [GC864](#) are specifically designed and developed by [Telit](#) for OEM usage and dedicated to portable data, voice and telematics applications such as:

- **Telemetry and Telecontrol (SCADA applications)**
- **Security systems**
- **Automated Meter Reading (AMR)**
- **Vending machines**
- **POS terminals**
- **PDA's and Mobile Computing**
- **Phones and Payphones**
- **Automotive and Fleet Management applications**
- **Battery powered applications needing a battery charger**
- **Return channel for digital broadcasting**
- **Applications, where the external application processor can be replaced by the PYTHON engine provided by the GE864-PY or GC864-PY**

All four models support the following functionalities

- ✓ **EASY GPRS (AT driven embedded TCP/IP protocol stack)**
- ✓ **EASY CAMERA (AT driven direct connection CAMERA function)**
- ✓ **EASY SCAN (full GSM frequency scanning)**
- ✓ **JAMMING DETECT & REPORT (detect the presence of disturbing devices)**

From the interface point of view, the [GE864](#) and [GC864](#) provides the following:

- ✓ **Full RS232 UART, CMOS level (ASC0) interface for AT commands:**
 - **Autobauding from 2.4 up to 57.6 Kbps**
 - **Fixed baud rate up to 115.2 Kbps**
- ✓ **Two wires RS232, CMOS level (ASC1) for PYTHON debug:**
- ✓ **SIM card interface, 1.8 / 3 volts with auto-detection, hot insertion**
- ✓ **21 x GPIO ports (max)**
- ✓ **3 x A/D converters**
- ✓ **1 x D/A converter**
- ✓ **1 x buzzer output**
- ✓ **1 x vibrator motor driver output**
- ✓ **1 x single led supply output**

In order to meet the competitive OEM and vertical market stringent requirements, Telit supports its customers with a dedicated Support Policy with:

- ☐ **Telit Evaluation Kit EVK2** to help you develop you application;
- ☐ A Website with all updated information available;
- ☐ an high level specialist technical support to assist you in your development;

For more updated information concerning product Roadmap and availability, technical characteristics, commercial and other issues, please check on the Telit website www.telit.com > Products > Modules.

NOTE: Some of the performances of the **Telit modules** depend on SW version installed on the module itself.

The **Telit modules** SW group is continuously working in order to add new features and improve the overall performances.

The **Telit modules** are easily upgradeable by the developer using the **Telit Flash Programmer**. Furthermore, all the **Telit modules** have the conformity assessment against R&TTE.

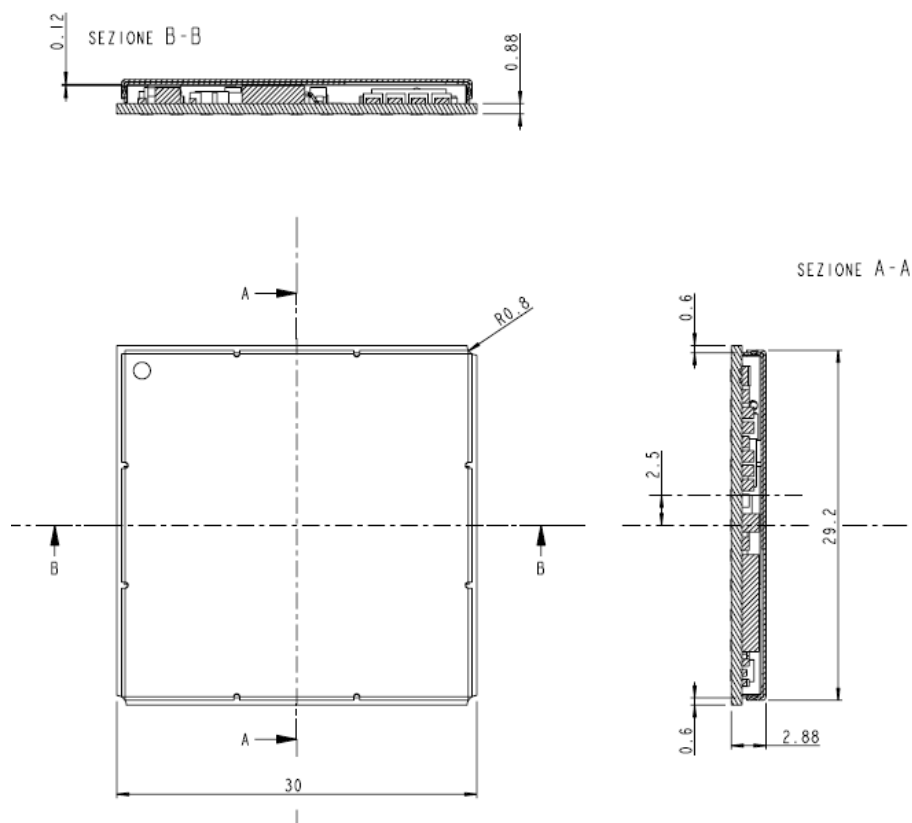
2 General Product Description

2.1 Size

2.1.1 GE864

The [Telit GE864 module](#) overall dimension are:

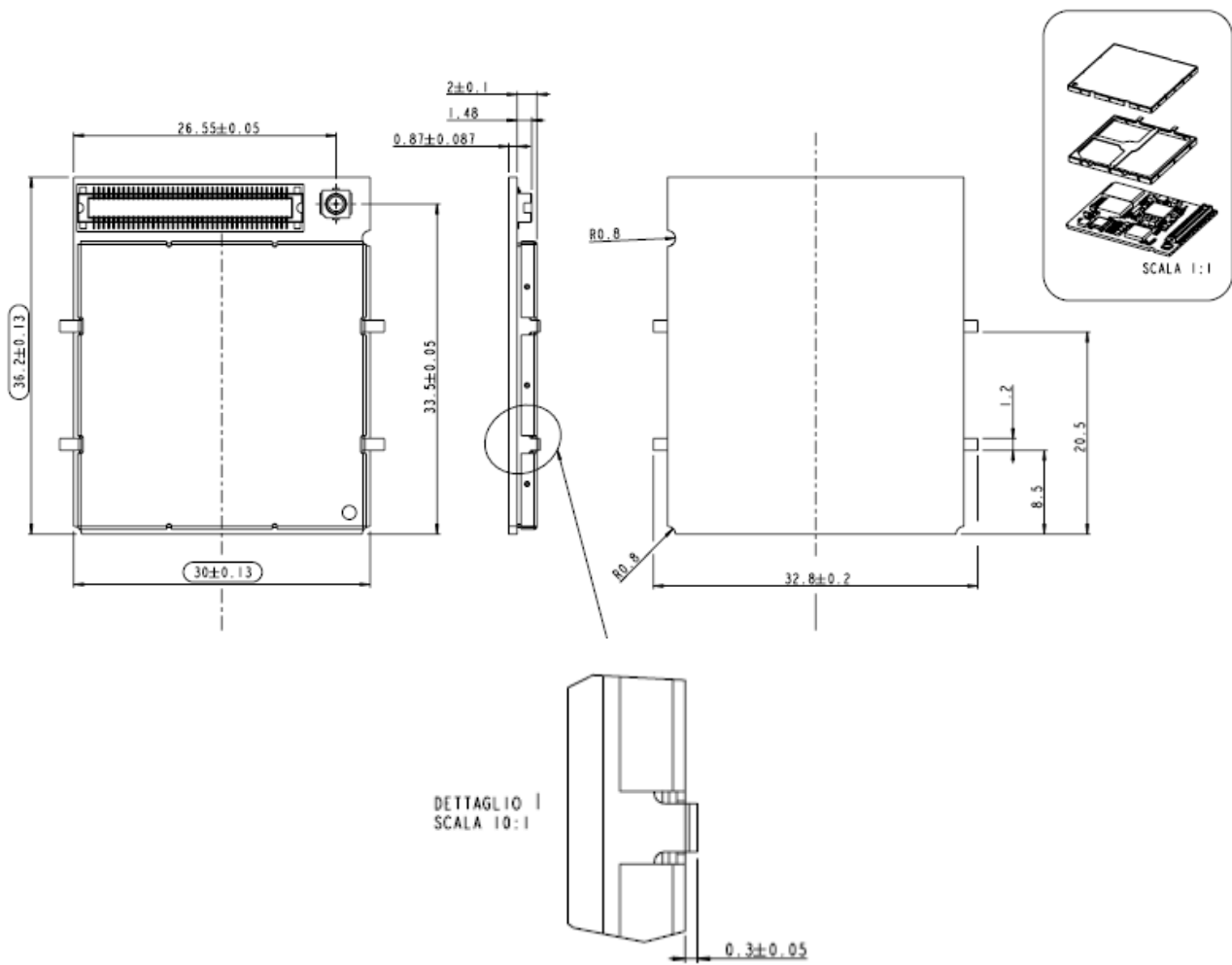
- **Length:** 30 mm
- **Width:** 30 mm
- **Thickness:** 2.8 mm



2.1.2 GC864

The **Telit GC864 module** overall dimensions are:

- **Length:** 36.2 mm
- **Width:** 30 mm
- **Thickness:** 3.2 mm



PRELIMINARY

2.2 Weight

- GE864: 6 gr
GC864: 8 gr. (preliminary)

2.3 Environmental requirements

The [Telit GE864](#) and [GC864](#) modules are compliant with the applicable ETSI reference documentation GSM 05.05 Release1998.

2.3.1 Temperature range

	GE864-QUAD / GE864-PY	GC864-QUAD / GC864-PY
Temperature in normal operating conditions	-10°C ÷ +55°C	-10°C ÷ +55°C
Temperature in extreme operating conditions*	-30°C ÷ +80°C (preliminary)	-30°C ÷ +80°C (preliminary)
Temperature in storage conditions	-30°C ÷ +85°C	-30°C ÷ +85°C

* Temperature exceeding the range of normal operating conditions can affect the sensitivity, the performance and the MTBF of the module.

2.3.2 Vibration Test (non functional)

- 10 ÷ 12Hz ASD = 1.92m 2 /s 3
- 12 ÷ 150Hz -3dB/oct

2.3.3 RoHS compliance

As a part of Telit corporate policy regarding environmental protection, the [GE864](#) and [GC864](#) comply with the RoHS (Restriction of Hazardous Substances) directive of the European Union.(EU Directive 2002/95/EG).

2.4 Operating Frequency

The operating frequencies in GSM, DCS, PCS modes are conform to the GSM specifications.

Mode	Freq. TX (MHz)	Freq. RX (MHz)	Channels (ARFC)	TX - RX offset
850	824.2÷848.8	869.2÷893.8	0 ÷ 124	45 MHz
E-GSM-900	890.0 - 914.8	935.0 - 959.8	0 – 124	45 MHz
	880.2 - 889.8	925.2 - 934.8	975 - 1023	45 MHz
DCS-1800	1710.2 - 1784.8	1805.2 - 1879.8	512 – 885	95 MHz
PCS-1900	1850.2 - 1909.8	1930.2 - 1989.8	512 - 810	80 MHz

2.5 Transmitter output power

GSM–850/900

The Telit GE864 and GC864 transceiver modules in GSM–850/900 operating mode are **class 4** in accordance with the specifications which determine the nominal 2W peak RF power (+33dBm) on 50 Ohm.

DCS–1800/PCS–1900

The Telit GE864 and GC864 transceiver modules in DCS–1800/PCS–1900 operating mode are **class 1** in accordance with the specifications which determine the nominal 1W peak RF power (+30dBm) on 50 Ohm.

2.6 Reference sensitivity

GSM–850/900

The sensitivity of the Telit GE864 and GC864 modules according to the specifications for the class 4 GSM 850/900 portable terminals are **–107 dBm** typical in normal operating conditions.

DCS–1800/PCS–1900

The sensitivity of the Telit GE864 and GC864 module according to the specifications for the class 1 portable terminals DCS-1800/PCS 1900 are **–106 dBm** typical in normal operating conditions.

2.7 Antenna

The antenna that the customer chooses to use should fulfill the following requirements:

Frequency range	Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s)
Bandwidth	136 MHz in GSM 850/900, 170 MHz in DCS, 140 MHz PCS
Gain	> 1.5 dBi
Impedance	50 ohm
Input power	> 2 W peak power
VSWR absolute max	10:1
VSWR recommended	<= 2:1

2.7.1 GC864 Antenna connector

The **GC864** module is equipped with a 50 Ohm RF connector from Murata, GSC type P/N **MM9329-2700B**.

The counterpart suitable is Murata **MXTK92** Type or **MXTK88** Type.

Moreover, the **GC864** has the antenna pads on the back side of the PCB. This allows the manual soldering of the coaxial cable directly on the back side of the PCB. However, the soldering is not an advisable solution for a reliable connection of the antenna.

2.8 SIM card holder support (GC864 only)

The **GC864** will have on the back side of the PCB, the necessary pads to manually solder a SIM card holder. The type of the SIM card holder and its final position is being defined and will be known soon.

2.9 Supply voltage

The external power supply must be connected to VBATT signal and must fulfill the following requirements:

- Nominal operating voltage 3.8 V
- Operating voltage range 3.4 V - 4.2 V

Note: Operating voltage range must never be exceeded; care must be taken in order to fulfill min/max voltage requirements.

2.10 Power consumption

The typical current consumption of the **Telit GE864** and **GC864** are:

Power off current (typical)	< 26 μ A;
Stand-by current (GSM Idle)	< 4 mA _{rms}
Operating current in voice ch.	170 mA _{rms} \pm 20% @ typical network conditions
Operating current in voice ch.	< 270 mA _{rms} 1.9 A _{peak} @ worst network conditions
Operating current in GPRS class 10	< 500 mA _{rms} @ typical network conditions

2.11 Embodied Battery charger

The battery charger is suited for 3.7V Li-Ion rechargeable battery (suggested capacity 500-1000mAh). The Charger needs only a CURRENT LIMITED power source input and charges the battery directly through VBATT connector pins.

Battery charger input pin	CHARGE
---------------------------	--------

Battery pins	VBATT, GND
Battery charger input voltage min	5.0 V
Battery charger input voltage typ	5.5 V
Battery charger input voltage max	7.0 V
Battery charger input current max	400mA
Battery type	Li-Ion rechargeable

NOTE: If embodied battery charger is used, then a LOW ESR capacitor of at least 100µF must be mounted in parallel to VBATT pin.

NOTE: when power is supplied to the CHARGE pin, a battery must always be connected to the VBATT pin of the GE864 / GC864.

2.12 User Interface

The user interface is managed by AT commands specified on the ITU-T V.250, GSM 07.07 and 07.05 specifications.

2.12.1 Speech Coding

The [GE864](#) and [GC864](#) vocoders support the following rates:

- ☐ Half Rate
- ☐ Full rate
- ☐ Enhanced Full Rate
- ☐ Adaptive Multi Rate

2.12.2 SIM Reader

The [GE864](#) and [GC864](#) support phase 2 GSM11.14 - SIM 3V volts ONLY with an external SIM connector. For 5V SIM operation an external level translator can be added.

2.12.3 SMS

The [GE864](#) and [GC864](#) support the following SMS types:

- ☐ Mobile Terminated (MT) class 0 – 3 with signaling of new incoming SMS, SIM full, SMS read
- ☐ Mobile Originated class 0 – 3 with writing, memorize in SIM and sending
- ☐ Cell Broadcast compatible with CB DRX with signaling of new incoming SMS.

2.12.4 Real Time Clock and Alarm

The [Telit GE864](#) and [GC864](#) support the Real Time Clock and Alarm functions through AT commands, furthermore an alarm output pin (GPIO6) can be configured to indicate the alarm with a hardware line output.

Furthermore the Voltage Output of the RTC power supply is provided so that a backup capacitor can be added to increase the RTC autonomy.

2.12.5 Data/fax transmission

The [Telit GE864](#) and [GC864](#) support:

- ☐ GPRS Class 10, MS Class B
- ☐ CSD up to 14.4 Kbps
- ☐ Fax service, Class 1 Group 3

2.12.6 Local security management

With lock of Subscriber Identity module (SIM), and security code request at power-up.

2.12.7 Call control

Call cost control function.

2.12.8 Phonebook

This function allows the storing of the telephone numbers in SIM memory.
The capability depends on SIM version/memory.

2.12.9 Characters management

The [Telit GE864](#) and [GC864](#) supports the IRA characters set (International Reference Alphabet), in TEXT and PDU mode.

2.12.10 SIM related functions

Activation/deactivation of the numbers stored in phone book FDN, ADN and PINs. Extension at the PIN2 for the PUK2 insertion capability for lock condition.

2.12.11 Call status indication

The call status indication by AT commands is supported.

2.12.12 Indication of network service availability

The STAT_LED pin status shows information on the network service availability and Call status. The pin is an Open Collector output where it is possible to directly connect a LED to show information on the network service availability and Call status.

Therefore, the status indicated in the following table is reversed with respect to the pin status.

STAT_LED indications

LED status	Device Status
permanently off	device off
fast blinking (period 1s, Ton 0,5s)	Net search / Not registered / turning off
slow blinking (period 3s, Ton 0,3s)	Registered full service
Permanently on	a call is active

2.12.13 Automatic answer (Voice, Data or FAX)

After a specified number of rings, the module will automatically answer with a beep. The user can set the number of rings by means of the command `ATS0=<n>`.

2.12.14 Supplementary services (SS)

- ☐ Call Barring,
- ☐ Call Forwarding,
- ☐ Calling Line Identification Presentation (CLIP),
- ☐ Calling Line Identification Restriction (CLIR),
- ☐ Call Waiting, other party call Waiting Indication,
- ☐ Call Hold, other party Hold / Retrieved Indication,
- ☐ Closed User Group supplementary service (CUG),
- ☐ Advice of Charge,
- ☐ Unstructured SS Mobile Originated (MO)

2.12.15 Acoustic signaling

The acoustic signaling of the [GE864](#) and [GC864](#) on the selected acoustic device are the following:

- ☐ Call waiting;
- ☐ Ringing tone;
- ☐ SMS received tone;
- ☐ Busy tone;
- ☐ Power on/off tone;
- ☐ Off Hook dial tone;
- ☐ Congestion tone;
- ☐ Connected tone;
- ☐ Call dropped;

- ☐ No service tone;
- ☐ Alarm tone.

2.12.16 DTMF tones

The DTMF tones are managed by specific AT commands. These tones are generated with AT commands only during voice calls. The minimum duration of a DTMF tone is 100 ms.

Group low	Group high		
	1209 Hz	1336 Hz	1477 Hz
697 Hz	1	2	3
770 Hz	4	5	6
852 Hz	7	8	9
941 Hz	*	0	#

NOTE: The GSM system architecture defines that the audio signal of the DTMF tones is inserted by the network switches on commands sent by the Mobile Station (MS). Thus, the default duration parameters may vary from network to network. In case that the devices to be controlled by DTMF are sensitive related to the duration of the tones and timing of the sequences, dedicated investigations on the parameter settings have to be made.

2.12.17 Buzzer output

The General Purpose I/O pin GPIO7 can be configured to output the BUZZER output signal, with only an external Mosfet/transistor and a diode a Buzzer can be directly driven.

The ringing tone and the other signaling tones can be redirected to this Buzzer output with a specific AT command.

2.12.18 RF Transmission Monitor

As alternate function of the GPIO5, the [GE864](#) and [GC864](#) provide the RF transmission monitor. When the alternate function is activated, the pin of GPIO5 changes to HIGH every time the module transmits an RF signal and remains HIGH for the duration of the transmission sequence, i.e. it does not change with every GSM signal burst.

2.13 Logic level specifications

Where not specifically stated, all the interface circuits work at 2.8V CMOS logic levels.

The following table shows the logic level specifications used in the [GE864](#) and [GC864](#) interface circuits:

Absolute Maximum Ratings -Not Functional

Parameter	Min	Max
Input level on any	-0.3V	+3.75V

digital pin when on		
Input voltage on analog pins when on	-0.3V	+3.0 V

Operating Range - Interface levels (2.8V CMOS)

Level	Min	Max
Input high level	2.1V	3.3V
Input low level	0V	0.5V
Output high level	2.2V	3.0V
Output low level	0V	0.35V

For 2,0V signals:

Operating Range - Interface levels (2.0V CMOS)

Level	Min	Max
Input high level	1.6V	3.3V
Input low level	0V	0.4V
Output high level	1,65V	2.2V
Output low level	0V	0.35V

2.13.1 Reset signal

Signal	Function	I/O	GE864 ball	GC864 pin
RESET	Phone reset	I/O	A2	54

RESET is used to reset the [GE864](#) and [GC864](#). Whenever this signal is pulled low, the [GE864 / GC864](#) is reset. When the device is reset it stops any operation and after the release of the reset it shuts down, without doing any detach operation from the network where it is registered to. This behavior is not a proper shut down because any GSM device is requested to issue a detach request on turn off. For this reason the Reset signal must not be used to normally shutting down the device, but only as an emergency exit in the rare case the device remains stuck waiting for some network response.

The RESET is internally controlled on start-up to achieve always a proper power-on reset sequence, so there's no need to control this pin on start-up. It may only be used to reset a device already on that is not responding to any command.

NOTE: do not use this signal to power off the [Telit GE864 / GC864 module](#). Use the `ON_OFF*` signal to perform this function or the `AT#SHDN` command.

Reset Signal Operating levels:

Signal	Min	Max
RESET Input high	2.2V*	3.3V
RESET Input low	0V	0.2V

* this signal is internally pulled up so the pin can be left floating if not used.

If unused, this signal may be left unconnected. If used, then it **must always be connected with an open collector transistor**, to allow to the internal circuitry the power on reset and under voltage lockout functions.

2.14 RTC Bypass out

The VRTC signal brings out the Real Time Clock supply which is separate from the rest of the digital part, allowing having only RTC going on when all the other parts of the device are off.

To this power output a backup capacitor can be added in order to increase the RTC autonomy during power off of the battery. NO Devices must be powered from this pin.

2.15 VAUX power output

A regulated power supply output is provided in order to supply small devices from module.

This output is active when the module is ON and goes off when module is shut down.

The operating range characteristics of the supply are:

Operating Range - Vout power supply

	Min	Typ	Max
Output voltage	2.75V	2.85V	2.95V
Output current			100mA
Output bypass capacitor			2.2μF

2.16 Audio levels specifications

The audio of the [GE864 / GC864](#) is organized into two main paths:

- internal path (called also MT)
- external path (called also HF)

These two paths are meant respectively for handset and headset/hands-free use. The [GE864 / GC864](#) has a built in echo canceller and a noise suppressor, tuned separately for the two audio paths; for the internal path the echo canceller parameters are suited to cancel the echo generated by a handset, while for the external audio path they are suited for a hands-free use.

For more information on the audio refer to the Hardware User Guide.

The following table reports all the audio level specifications.

Microphone characteristics

	Internal audio mic. input	External audio mic. input
Line coupling	AC (100nF cond.)	AC (100nF cond.)
Line type	Balanced	Balanced
Differential input resistance	50k Ω	50k Ω
Line nominal sensitivity	50mV _{rms} \pm 2dB	3mV _{rms} \pm 2dB
Max input voltage	360mV _{rms}	22mV _{rms}
Microphone nominal sensitivity – Analog Gain suggested	-45dB _{Vrms/Pa} \pm 2dB / +24dB	-45dB _{Vrms/Pa} \pm 2dB / +10dB
Echo canceller type	handset	Car kit hands free

Speaker characteristics

	Internal audio ear. output	External audio ear. output
Line coupling	DC	DC
Line type	Bridged	Bridged
Speaker impedance	$\geq 16\Omega \pm 5\%$ @ 1kHz	$\geq 16\Omega \pm 5\%$ @ 1kHz
Minimum load impedance	15 Ω	15 Ω
Signal bandwidth	150-8000 Hz @ -3dB	150-8000 Hz @ -3dB
Maximum output	1,3 V _{rms}	1,3 V _{rms}
Maximum power output	80mW/16 Ω	80mW/16 Ω
Volume level steps (SW)	-2dB	-2dB
Number of volume steps (SW)	14	14

2.17 Camera compatibility (EASY CAMERA)

The [GE864 / GC864](#) provides a direct support for the camera whose characteristics are the following:

Model:	TRANSHIP TC5747
Technology:	CMOS COLOR camera
Max picture size:	VGA 640x480 pixels
Output format:	JPEG
Sensitivity:	4V/lux-sec (including gain)

The camera will be directly managed by the hardware/software with some interface circuitry, providing a custom AT command interface to operate with it.

The camera interface requires the pins and GPIOs:

Signal	GE864 ball	GC864 pin
CAM_SDA	D7	36
CAM_SCL	C6	35
CAM_CLK	F8	44
CAM_ON	K11	67
CAM_RST	C9	76

When the camera is activated, then these pins are not accessible as GPIO.

The AT commands of the module allows to take a snapshot and successively download it through the serial line in various formats.

2.18 Converters

2.18.1 ADC Converter

The on board A/D are 11-bit converter. They are able to read a voltage level in the range of 0÷2 volts applied on the ADC pin input, store and convert it into 11 bit word.

	Min	Max	Units
Input Voltage range	0	2	Volt
AD conversion	-	11	bits
Resolution	-	< 1	mV
Sampling rate	1 (idle)	60 (on traffic)	secs

2.18.2 DAC Converter

The on board DAC is a 10 bit converter, able to generate a analogue value based a specific input in the range from 0 up to 1023. However, an external low-pass filter is necessary. See the HW User Guide for the details.

	Min	Max	Units
Voltage range (filtered)	0	2	Volt
Range	0	1023	Steps

2.19 Board to Board interface

2.19.1 GE864 balls allocation

Ball	Signal	I/O	Function	Internal PULL UP	Type
Audio					
H9	EAR_MT-	AO	Handset earphone signal output, phase -		Audio
G10	EAR_MT+	AO	Handset earphone signal output, phase +		Audio
H10	EAR_HF+	AO	Handsfree ear output, phase +		Audio
J10	EAR_HF-	AO	Handsfree ear output, phase -		Audio
J8	MIC_MT+	AI	Handset mic.signal input; phase+, nom. level 50mVrms		Audio
G9	MIC_MT-	AI	Handset mic.signal input; phase-, nom. level 50mVrms		Audio
G8	MIC_HF+	AI	Handsfree mic. input; phase +, nom. level 3mVrms		Audio
J9	MIC_HF-	AI	Handsfree mic.input; phase -, nom. level 3mVrms		Audio
F9	AXE	I	Handsfree switching	100K	CMOS 2.8V
G5	VMICP	O	Microphone supply (*)		
G3	VMICN	O	Microphone supply (*)		
SIM card interface					
C10	SIMCLK	O	External SIM signal – Clock		1,8 / 3V
E9	SIMRST	O	External SIM signal – Reset		1,8 / 3V
D10	SIMIO	I/O	External SIM signal - Data I/O		1,8 / 3V
C11	SIMIN	I	External SIM signal - Presence (active low)	47K	1,8 / 3V
D4	SIMVCC	-	External SIM signal – Power supply for the SIM		1,8 / 3V
Trace					
D11	TX_TRACE	O	TX Data for debug monitor		CMOS 2.8V
F10	RX_TRACE	I	RX Data for debug monitor		CMOS 2.8V
Prog. / Data + HW Flow Control					
E7	C103/TXD	I	Serial data input (TXD) from DTE		CMOS 2.8V
H8	C104/RXD	O	Serial data output to DTE		CMOS 2.8V
B7	C108/DTR	I	Input for Data terminal ready signal (DTR) from DTE		CMOS 2.8V
F7	C105/RTS	I	Input for Request to send signal (RTS) from DTE		CMOS 2.8V
F6	C106/CTS	O	Output for Clear to send signal (CTS) to DTE		CMOS 2.8V
D9	C109/DCD	O	Output for Data carrier detect signal (DCD) to DTE		CMOS 2.8V
E11	C107/DSR	O	Output for Data set ready signal (DSR) to DTE		CMOS 2.8V
B6	C125/RING	O	Output for Ring indicator signal (RI) to DTE		CMOS 2.8V
IIC bus					
D7	CAM_SDA / IIC_SDA	I/O	Camera IIC interface / Configurable GPIO		CMOS 2.8V
C6	CAM_SCL / IIC_SCL	I/O	Camera IIC interface / Configurable GPIO		CMOS 2.8V
DAC and ADC					

Ball	Signal	I/O	Function	Internal PULL UP	Type
C7	DAC_OUT	AO	Digital/Analog converter output		D/A
J11	ADC_IN1	AI	Analog/Digital converter input		A/D
H11	ADC_IN2	AI	Analog/Digital converter input		A/D
G11	ADC_IN3	AI	Analog/Digital converter input		A/D
Miscellaneous Functions					
A2	RESET*	I	Reset input		
E2	VRTC	AO	VRTC Backup capacitor		Power
D8	STAT_LED	O	Status indicator led		CMOS 1.8V
G1	CHARGE	AI	Charger input (*)		Power
G2	CHARGE	AI	Charger input (*)		Power
F8	MON1 / CAM_CLK	I/O	MON1 / Camera interface		CMOS 2.8V
J5	ON_OFF*	I	Input command for switching power ON or OFF (toggle command). The pulse to be sent to the GE864 must be equal or greater than 1 second.	47K	Pull up to VBATT
D5	VAUX1	-	Power output for external accessories		-
C5	VIBRO_EP	O	Vibrator motor driver output (*)		
L8	PWRMON	O	Power ON Monitor		CMOS 2.8V
L4	Antenna	O	Antenna output - 50 ohm		RF
GPIO					
G4	TGPIO_12	I/O	Telit GPIO12 Configurable GPIO		CMOS 2.8V
E5	TGPIO_23	I/O	Reserved to detect ON/OFF. It is physically connected to L8 (PWRMON)		CMOS 2.8V
C2	TGPIO_03	I/O	Telit GPIO03 Configurable GPIO		CMOS 2.8V
B3	TGPIO_04	I/O	Telit GPIO04 Configurable GPIO		CMOS 2.8V
C3	TGPIO_20	I/O	Telit GPIO20 Configurable GPIO		CMOS 2.8V
B4	TGPIO_14	I/O	Telit GPIO14 Configurable GPIO		CMOS 2.8V
D1	TGPIO_11	I/O	Telit GPIO11 Configurable GPIO		CMOS 2.8V
B1	TGPIO_19	I/O	Telit GPIO19 Configurable GPIO		CMOS 2.8V
C1	TGPIO_01	I/O	Telit GPIO01 Configurable GPIO		CMOS 2.8V
K7	TGPIO_18	I/O	Telit GPIO18 I/O pin		CMOS 2.8V
H5	TGPIO_17	I/O	Telit GPIO17 GPIO pin		CMOS 2.8V
F5	TGPIO_15	I/O	Telit GPIO15 GPIO pin		CMOS 2.8V
K11	TGPIO_08 / CAM_ON	I/O	Telit GPIO08 Configurable GPIO / Camera Interface		CMOS 2.8V
B5	TGPIO_06 / ALARM	I/O	Telit GPIO06 Configurable GPIO / ALARM		CMOS 2.8V
C9	TGPIO_09 / CAM_RST	I/O	Telit GPIO09 GPIO I/O pin / Camera Interface		CMOS 2.8V
E6	TGPIO_02 / JDR	I/O	Telit GPIO02 I/O pin / Jammer detect report		CMOS 2.8V
L9	TGPIO_07 / BUZZER	I/O	Telit GPIO07 Configurable GPIO / Buzzer		CMOS 2.8V
H6	TGPIO_16	I/O	Telit GPIO16 Configurable GPIO		CMOS 2.8V
K10	TGPIO_13	I/O	Telit GPIO13 Configurable GPIO		CMOS 2.8V
K8	TGPIO_05 / RFTXMON	I/O	Telit GPIO05 Configurable GPIO / Transmitter ON monitor		CMOS 2.8V
L10	TGPIO_21	I/O	Telit GPIO21 Configurable GPIO		CMOS 2.8V
E8	TGPIO_22	I/O	Telit GPIO22 Configurable GPIO		CMOS 1.8V (not 2.8V !!)
H3	TGPIO_10	I/O	Telit GPIO10 I/O pin		CMOS 2.8V
Power Supply					
J1	VBATT	-	Main power supply		Power

Ball	Signal	I/O	Function	Internal PULL UP	Type
K1	VBATT	-	Main power supply		Power
J2	VBATT	-	Main power supply		Power
K2	VBATT	-	Main power supply		Power
A1	GND	-	Ground		Power
F1	GND	-	Ground		Power
H1	GND	-	Ground		Power
L1	GND	-	Ground		Power
H2	GND	-	Ground		Power
L2	GND	-	Ground		Power
J3	GND	-	Ground		Power
K3	GND	-	Ground		Power
L3	GND	-	Ground		Power
K4	GND	-	Ground		Power
K5	GND	-	Ground		Power
D6	GND	-	Ground		Power
K6	GND	-	Ground		Power
L6	GND	-	Ground		Power
A11	GND	-	Ground		Power
F11	GND	-	Ground		Power
L11	GND	-	Ground		Power
RESERVED					
A3		-			
F3		-			
J4		-			
J6		-			
J7		-			
L7		-			
F4		-			
F2		-			
E3		-			
E4		-			
D2		-			
E1		-			
G7		-			
H7		-			
G6		-			
A9		-			
B9		-			
A8		-			
A10		-			
C8		-			

Ball	Signal	I/O	Function	Internal PULL UP	Type
B10		-			
B11		-			
B8		-			
A7		-			
A6		-			
A5		-			
A4		-			
B2		-			
H4		-			
C4		-			
D3		-			
K9		-			
L5		-			
E10		-			

NOTE: RESERVED pins must not be connected

2.19.2 GE864 BGA balls layout

**TOP
VIEW**

	A	B	C	D	E	F	G	H	J	K	L
1	GND	TGPIO_19	TGPIO_01	TGPIO_11	-	GND	CHARGE	GND	VBATT	VBATT	GND
2	RESET*	-	TGPIO_03	-	VRTC	-	CHARGE	GND	VBATT	VBATT	GND
3	-	TGPIO_04	TGPIO_20	-	-	-	VMICN	TGPIO_10	GND	GND	GND
4	-	TGPIO_14	-	SIMVCC	-	-	TGPIO_12	-	-	GND	Antenna
5	-	TGPIO_06 / ALARM	VIBRO_EP	VAUX1	TGPIO_23	TGPIO_15	VMICP	TGPIO_17	ON_OFF*	GND	-
6	-	C125/RING	CAM_SCL / IIC_SCL	GND	TGPIO_02 / JDR	C106 / CTS	-	TGPIO_16	-	GND	GND
7	-	C108 / DTR	DAC_OUT	CAM_SDA / IIC_SDA	C103 / TXD	C105 / RTS	-	-	-	TGPIO_18	-
8	-	-	-	STAD_LED	TGPIO_22	MON1 / CAM_CLK	MIC_HF+	C104 / RXD	MIC_MT+	TGPIO_05 / RFTXMON	PWRMON / TESTMODE*
9	-	-	TGPIO_09 / CAM_RST	C109 / DCD	SIMRST	AXE	MIC_MT-	EAR_MT-	MIC_HF-	-	TGPIO_07 / BUZZER
10	-	-	SIMCLK	SIMIO	-	RX_TRACE	EAR_MT+	EAR_HF+	EAR_HF-	TGPIO_13	TGPIO_21
11	GND	-	SIMIN	TX_TRACE	C107 / DSR	GND	ADC_IN3	ADC_IN2	ADC_IN1	TGPIO_08 / CAM_ON	GND

	AUDIO Signals balls
	SIM CARD interface balls
	TRACE Signals balls
	Prog. / data + Hw Flow Control signals balls
	IIC signals balls
	DAC and ADC signals balls
	MISCELLANEOUS functions signals balls
	TELIT GPIO balls
	POWER SUPPLY VBATT balls
	POWER SUPPLY GND balls
	RESERVED

2.19.3 GC864 pins allocation

The **GC864** uses an 80 pin Molex p.n. 53949-0878 male connector for the connections with the external applications. This connector matches the 54150-0808 model.

Pin	Signal	I/O	Function	Internal Pull up	Type
Power Supply					
1	VBATT	-	Main power supply		Power
2	VBATT	-	Main power supply		Power
3	VBATT	-	Main power supply		Power
4	VBATT	-	Main power supply		Power
5	GND	-	Ground		Power
6	GND	-	Ground		Power
7	GND	-	Ground		Power
Audio					
8	AXE	I	Handsfree switching	100K Ω	CMOS 2.8V
9	EAR_HF+	AO	Handsfree ear output, phase +		Audio
10	EAR_HF-	AO	Handsfree ear output, phase -		Audio
11	EAR_MT+	AO	Handset earphone signal output, phase +		Audio
12	EAR_MT-	AO	Handset earphone signal output, phase -		Audio
13	MIC_HF+	AI	Handsfree microphone input; phase +, nominal level 3mVrms		Audio
14	MIC_HF-	AI	Handsfree microphone input; phase -, nominal level 3mVrms		Audio
15	MIC_MT+	AI	Handset microphone signal input; phase+, nominal level 50mVrms		Audio
16	MIC_MT-	AI	Handset microphone signal input; phase-, nominal level 50mVrms		Audio
SIM Card Interface					
18	SIMVCC	-	External SIM signal – Power supply for the SIM		1.8/3V
19	SIMRST	O	External SIM signal – Reset		1.8/3V

Pin	Signal	I/O	Function	Internal Pull up	Type
20	SIMIO	I/O	External SIM signal - Data I/O		1.8/3V
21	SIMIN	I	External SIM signal - Presence (active low)	47K Ω	1.8/3V
22	SIMCLK	O	External SIM signal - Clock		1.8/3V
Trace					
23	RX_TRACE	I	RX Data for debug monitor		CMOS 2.8V
24	TX_TRACE	O	TX Data for debug monitor		CMOS 2.8V
Prog. / Data + Hw Flow Control					
25	C103/TXD	I	Serial data input (TXD) from DTE		CMOS 2.8V
26	C104/RXD	O	Serial data output to DTE		CMOS 2.8V
27	C107/DSR	O	Output for Data set ready signal (DSR) to DTE		CMOS 2.8V
28	C106/CTS	O	Output for Clear to send signal (CTS) to DTE		CMOS 2.8V
29	C108/DTR	I	Input for Data terminal ready signal (DTR) from DTE		CMOS 2.8V
30	C125/RING	O	Output for Ring indicator signal (RI) to DTE		CMOS 2.8V
31	C105/RTS	I	Input for Request to send signal (RTS) from DTE		CMOS 2.8V
32	C109/DCD	O	Output for Data carrier detect signal (DCD) to DTE		CMOS 2.8V
IIC					
35	CAM_SCL / IIC_SCL	I/O	Camera IIC interface / Configurable GPIO		CMOS 2.8V
36	CAM_SDA / IIC_SDA	I/O	Camera IIC interface / Configurable GPIO		CMOS 2.8V
DAC and ADC					
37	ADC_IN1	AI	Analog/Digital converter input		A/D
38	ADC_IN2	AI	Analog/Digital converter input		A/D
39	ADC_IN3	AI	Analog/Digital converter input		A/D
40	DAC_OUT	AO	Digital/Analog converter output		D/A
Miscellaneous Functions					
44	MON1_CAM	I/O	MON1 / Camera interface		CMOS 2.8V
45	STAT_LED	O	Status indicator led		CMOS 1.8V
46	GND	-	Ground		Ground
49	PWRMON	I	Power ON Monitor		CMOS 2.8V
50	VAUX1	-	Power output for external accessories		-
51	CHARGE	AI	Charger input (*)		Power
52	CHARGE	AI	Charger input (*)		Power
53	ON/OFF*	I	Input command for switching power ON or OFF (toggle command). The pulse to be sent to the GC864 must be equal or greater than 1 second.	47K Ω	Pull up to VBATT
54	RESET*	I	Reset input		
55	VRTC	AO	VRTC Backup capacitor		Power
Telit GPIO					
56	TGPIO_19	I/O	Telit GPIO19 Configurable GPIO		CMOS 2.8V
57	TGPIO_11	I/O	Telit GPIO11 Configurable GPIO		CMOS 2.8V
58	TGPIO_20	I/O	Telit GPIO20 Configurable GPIO		CMOS 2.8V
59	TGPIO_04	I/O	Telit GPIO4 Configurable GPIO		CMOS 2.8V
60	TGPIO_14	I/O	Telit GPIO14 Configurable GPIO		CMOS 2.8V

Pin	Signal	I/O	Function	Internal Pull up	Type
61	TGPIO_15	I/O	Telit GPIO15 GPIO pin		CMOS 2.8V
62	TGPIO_12	I/O	Telit GPIO12 Configurable GPIO		CMOS 2.8V
63	TGPIO_10	I/O	Telit GPIO10 I/O pin		CMOS 2.8V
64	TGPIO_22	I/O	Telit GPIO22 Configurable GPIO		CMOS 1.8V
65	TGPIO_18	I/O	Telit GPIO18 I/O pin		CMOS 2.8V
66	TGPIO_03	I/O	Telit GPIO03 Configurable GPIO		CMOS 2.8V
67	TGPIO_08 / CAM_ON	I/O	Telit GPIO08 Configurable GPIO / Camera Interface		CMOS 2.8V
68	TGPIO_06 / ALARM	I/O	Telit GPIO06 Configurable GPIO / ALARM		CMOS 2.8V
69	TGPIO_23	I/O	Reserved to detect ON/OFF. It is physically connected to pin 49 (PWRMON)		CMOS 2.8V
70	TGPIO_01	I/O	Telit GPIO01 Configurable GPIO		CMOS 2.8V
71	TGPIO_17	I/O	Telit GPIO17 GPIO pin		CMOS 2.8V
72	TGPIO_21	I/O	Telit GPIO21 Configurable GPIO		CMOS 2.8V
73	TGPIO_07 / BUZZER	I/O	Telit GPIO07 Configurable GPIO / Buzzer		CMOS 2.8V
74	TGPIO_02 / JDR	I/O	Telit GPIO02 I/O pin / Jammer detect report		CMOS 2.8V
75	TGPIO_16	I/O	Telit GPIO16 Configurable GPIO		CMOS 2.8V
76	TGPIO_09 / CAM_RST	I/O	Telit GPIO09 GPIO I/O pin 7 Camera Interface		CMOS 2.8V
77	TGPIO_13	I/O	Telit GPIO13 Configurable GPIO		CMOS 2.8V
78	TGPIO_05 / RFTXMON	I/O	Telit GPIO05 Configurable GPIO / Transmitter ON monitor		CMOS 2.8V
RESERVED					
17		-			
33		-			
34		-			
41		-			
42		-			
43		-			
47		-			
48		-			
79		-			
80		-			

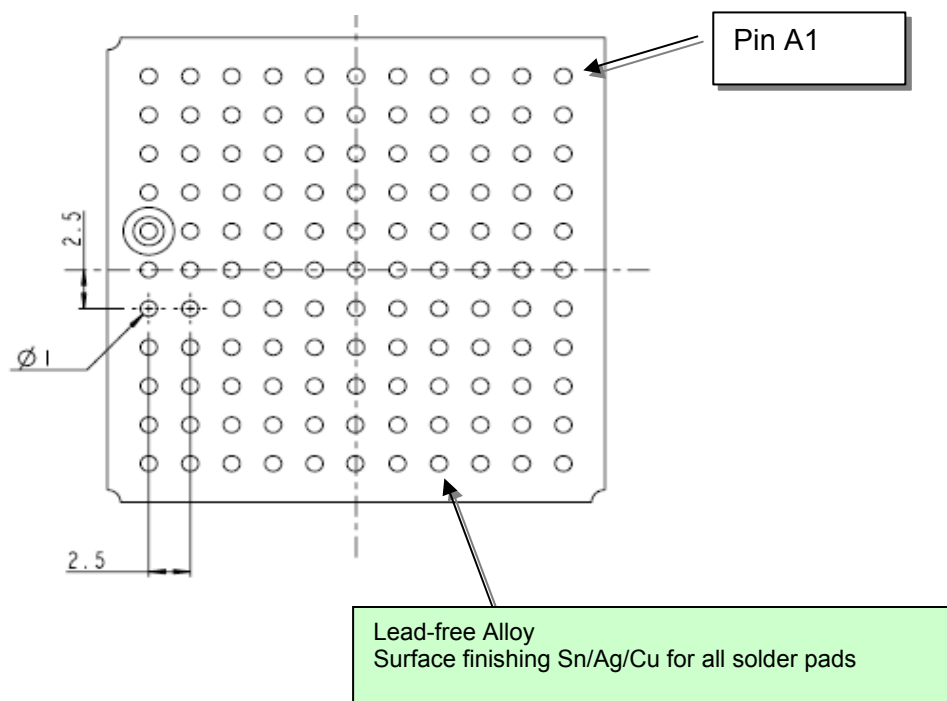
NOTE: RESERVED pins must not be connected

2.20 Mounting the GE864 on your Board

2.20.1 General

The [Telit GE864 modules](#) has been designed in order to be compliant with a standard lead-free SMT process.

2.20.2 Module finishing & dimensions

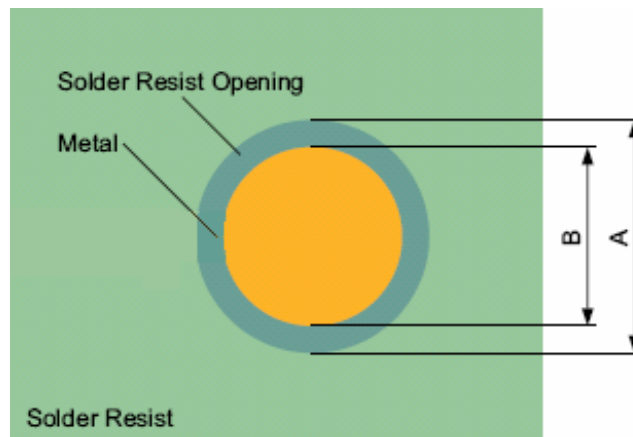
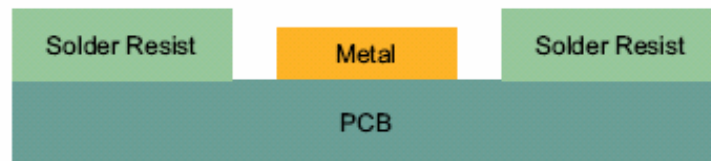


2.20.3 Stencil

Stencil's apertures layout can be the same of the recommended footprint (1:1), we suggest a thickness of stencil foil $\geq 120\mu\text{m}$.

2.20.4 PCB pad design

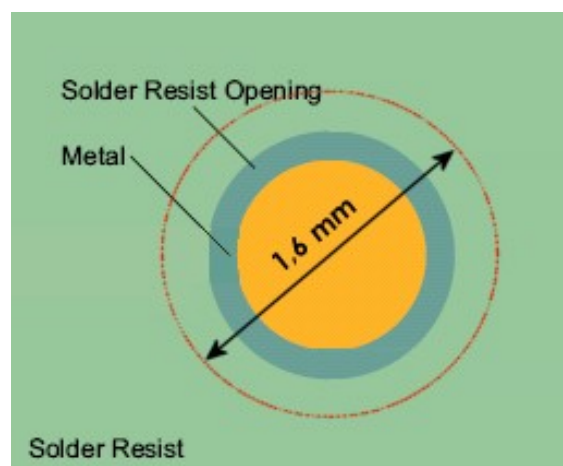
Non solder mask defined" (NSMD) type is recommended for the solder pads on the PCB.



Recommendations for PCB pad dimensions

Ball pitch [mm]	2,5
Solder resist opening diameter A [mm]	1,150
Metal pad diameter B [mm]	1 ± 0.05

Placement of microvias not covered by solder resist is not recommended inside the “Solder resist opening”, unless the microvia carry the same signal of the pad itself.



Holes in pad are allowed only for blind holes and not for through holes.

Recommendations for PCB pad surfaces:

Finish	Layer thickness [μm]	Properties
Electro-less Ni / Immersion Au	3 – 7 / 0.05 – 0.15	good solder ability protection, high shear force values

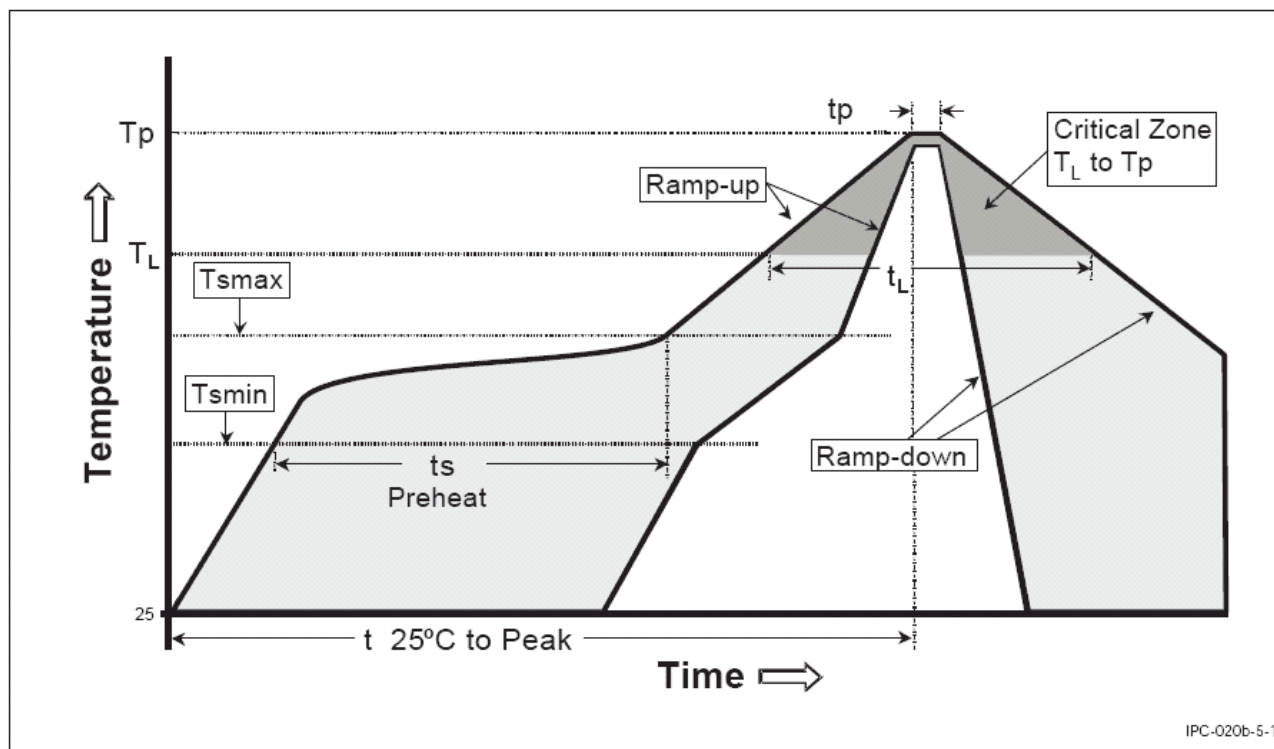
The PCB must be able to resist the higher temperatures which are occurring at the lead-free process. This issue should be discussed with the PCB-supplier. Generally, the wet-ability of tin-lead solder paste on the described surface plating is better compared to lead-free solder paste.

2.20.5 Solder paste

	Lead free
Solder paste	Sn/Ag/Cu

2.20.6 GE864 Solder reflow

The following is the recommended solder reflow profile



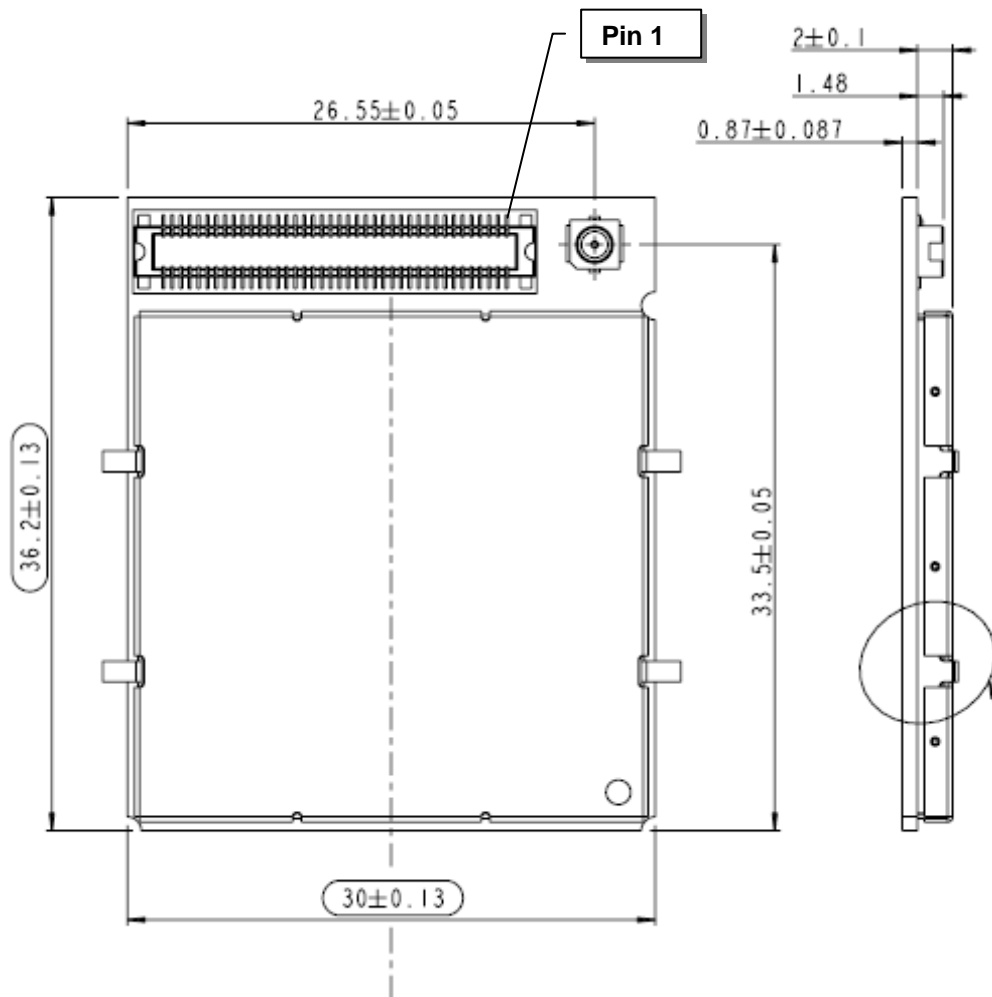
Profile Feature	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	3°C/second max
Preheat	
– Temperature Min (T_{smin})	150°C
– Temperature Max (T_{smax})	200°C
– Time (min to max) (t_s)	60-180 seconds
T_{smax} to T_L	
– Ramp-up Rate	3°C/second max
Time maintained above:	
– Temperature (T_L)	217°C
– Time (t_L)	60-150 seconds
Peak Temperature (T_P)	245 +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10-30 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

Note: All temperatures refer to topside of the package, measured on the package body surface.

Note: GE864 module can accept only one reflow process

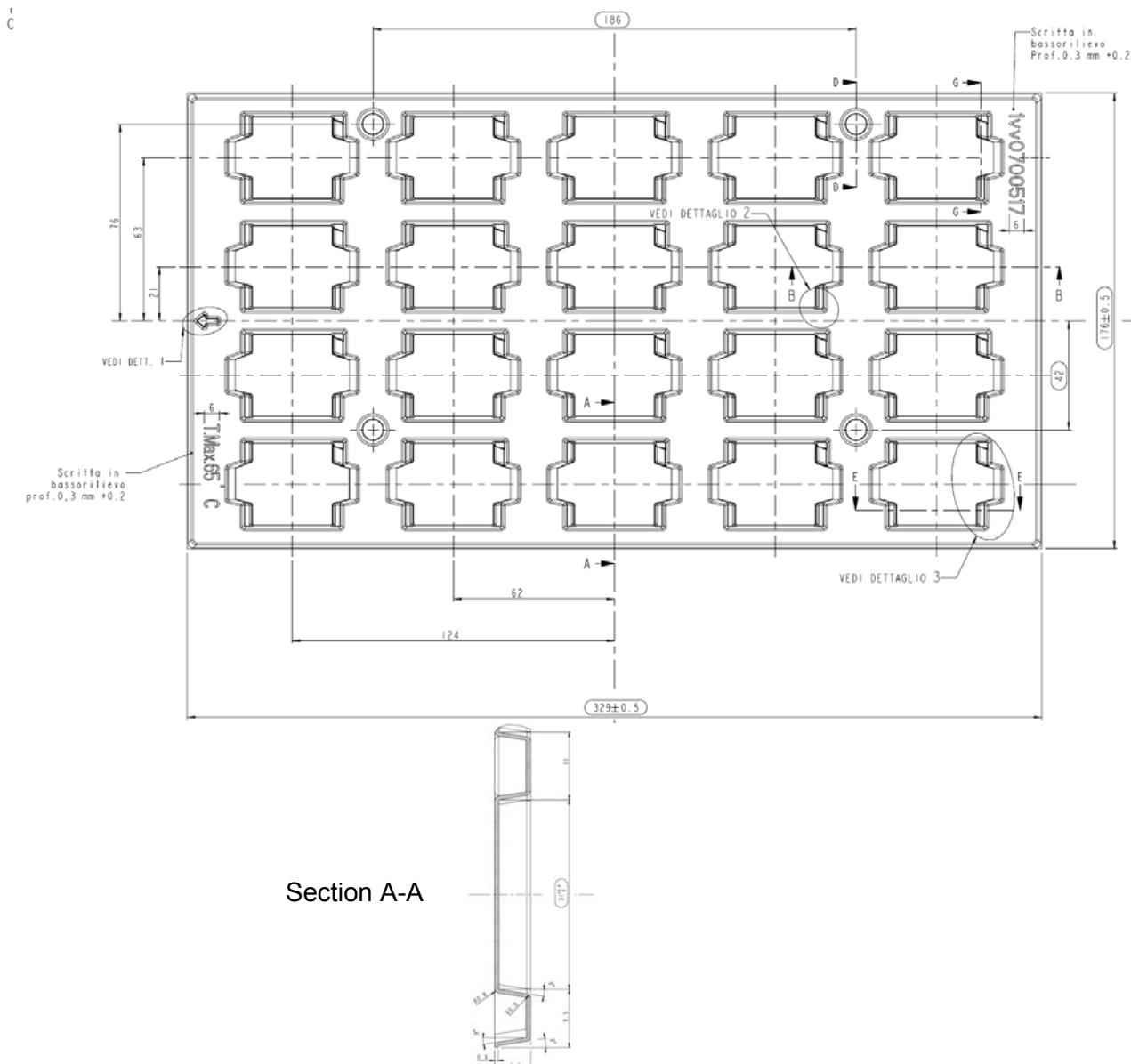
2.21 Mounting the GC864 on your board

The position of the Molex board to board connector and the pin 1 are shown in the following picture.



2.22 Packing system

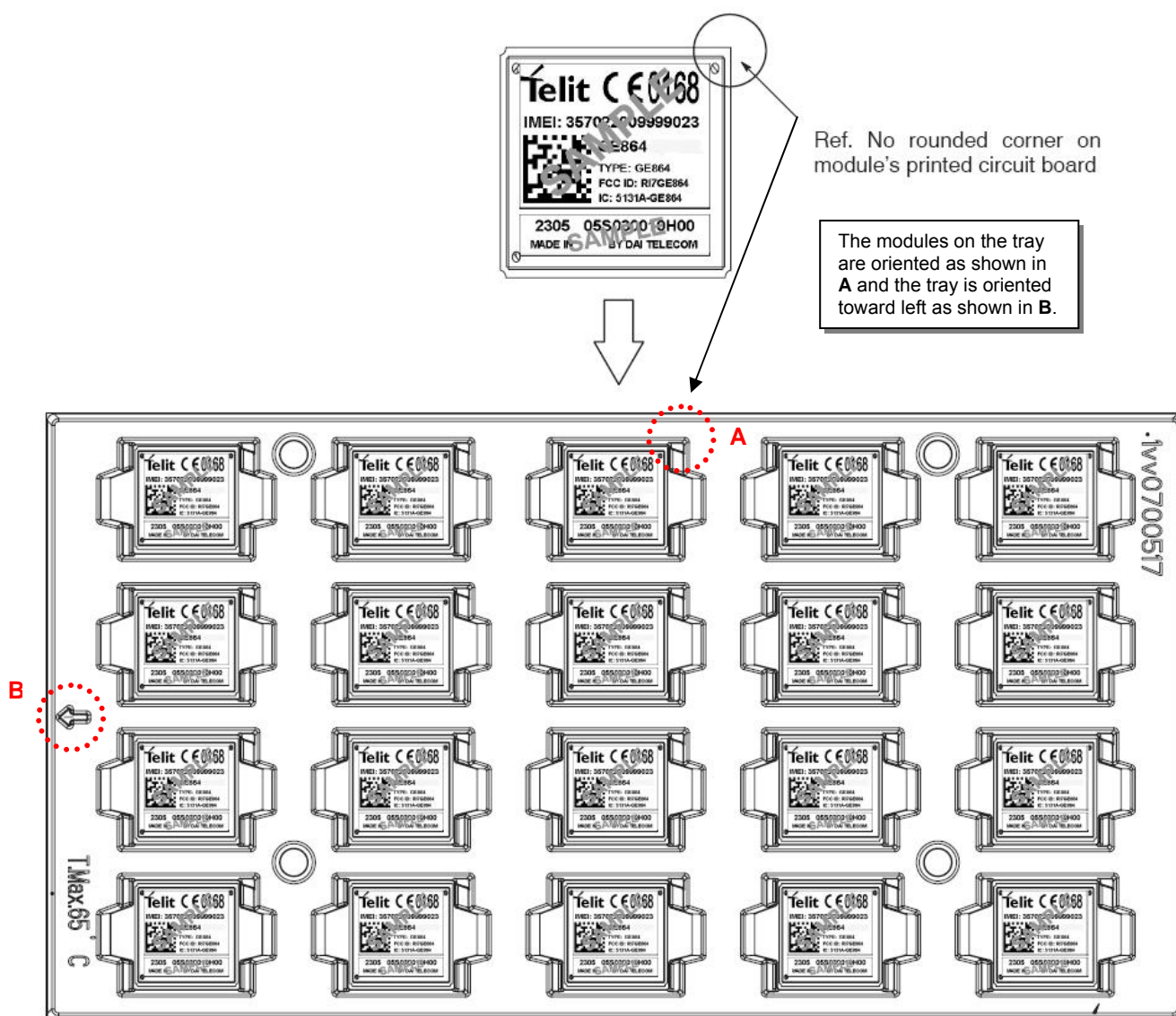
The **Telit GE864** and **GC864** are packaged on trays of 20 pieces each. This is especially suitable for the GE864 according to SMT processes for pick & place movement requirements.



The size of the tray is: 329 x 176mm

Note that trays can withstand at the maximum temperature of 65° C.

2.22.1 GE864 orientation on the tray



2.22.2 GC864 orientation on the tray

The **GC864** will use the same tray of the **GE864**, and will be placed with the board to board connector and the shield facing upper. The label including the IMEI number will be placed on the shield.

2.22.3 Moisture sensibility

The level of moisture sensibility of **GE864** module is “3”, in according with standard IPC/JEDEC J-STD-020, take care all the relatives requirements for using this kind of components.

3 Evaluation Kit

In order to assist you in the development of your [Telit GE864 / GC864 module](#) based application, Telit can supply the [EVK2 Evaluation Kit](#) with appropriate power supply, SIM card housing, RS 232 serial port level translator, direct UART connection, Handset, Headset and Hands-free (car kit) audio, antenna.

The [EVK2](#) provides a fully functional solution for a complete data/phone application.

The standard serial RS232 9 pin connector placed on the [Evaluation Kit](#) allows the connection of the [EVK2](#) system with a PC or other DTE.

The development of the applications utilizing the [Telit GE864 / GC864 module](#) must present a proper design of all the interfaces towards and from the module (e.g. power supply, audio paths, level translators), otherwise a decrease in the performances will be introduced or, in the worst case, a wrong design can even lead to an operating failure of the module.

In order to assist the hardware designer in his project phase, the [EVK2](#) board presents a series of different solutions, which will cover the most common design requirements on the market, and which can be easily integrated in the OEM design as building blocks or can be taken as starting points to develop a specific one.



GE864 / GC864 Evaluation Kit

3.1 Evaluation Kit description

For a detailed description of the [Telit Evaluation Kit](#) refer to the documentation provided with the Telit [GE864 / GC864](#) Hardware User Guide.

3.1.1 Power Supply

In the Board there are three different power sources, that embrace a wide range of applications, from the automotive +12V input to the stand alone battery powered device.

The power sources nominal input voltages are:

- +12V input (typically automotive)
- +5V input (typically embedded systems)
- +3.8V input (Li-Ion Battery)

Each one of these power sources can supply the [Telit GE864 / GC864 module](#) and the whole circuitry embodied in the [Evaluation Kit](#).

Only one of these power sources can be used at a time and it is selectable with two jumpers.

For the battery power supply a Li-Ion battery charger circuit is provided.

3.1.2 Serial interface

The communications between your application and the [Telit GE864 / GC864 module](#) must be done through a serial interface which can be a standard CMOS UART or a RS232 port.

All levels of the RS232 port are conforming to RS232 and V.24 standard and a PC serial port can be directly connected to this connector.

Both these interfaces are supported.

3.1.3 Audio

The [Evaluation Kit board](#) provides two software/hardware selectable audio paths, the internal and the external one. All the handset, headset and hands free-car kit functions are supported.

Furthermore for each audio path two solutions are presented: single ended and balanced

3.1.4 GPIO and Leds

All the General Purpose Input Output ports of the [Telit GE864 / GC864 module](#) are supported in a dedicated connector and several leds are added as a debug aid.

4 Service and firmware update

The serial cable used for the communication with a PC can be also used to update the [Telit GE864 / GC864 module](#) firmware. The RS232 connector DB type 9 pin 90° is used to connect the [Telit Evaluation Kit](#) to any DTE .

All levels are conformed to RS232 and V.24 standard and a PC serial port can be directly connected to this connector.

The firmware update can be done with a specific software tool provided by Telit that runs on windows based PCs.

4.1 Step-by-Step upgrade procedure

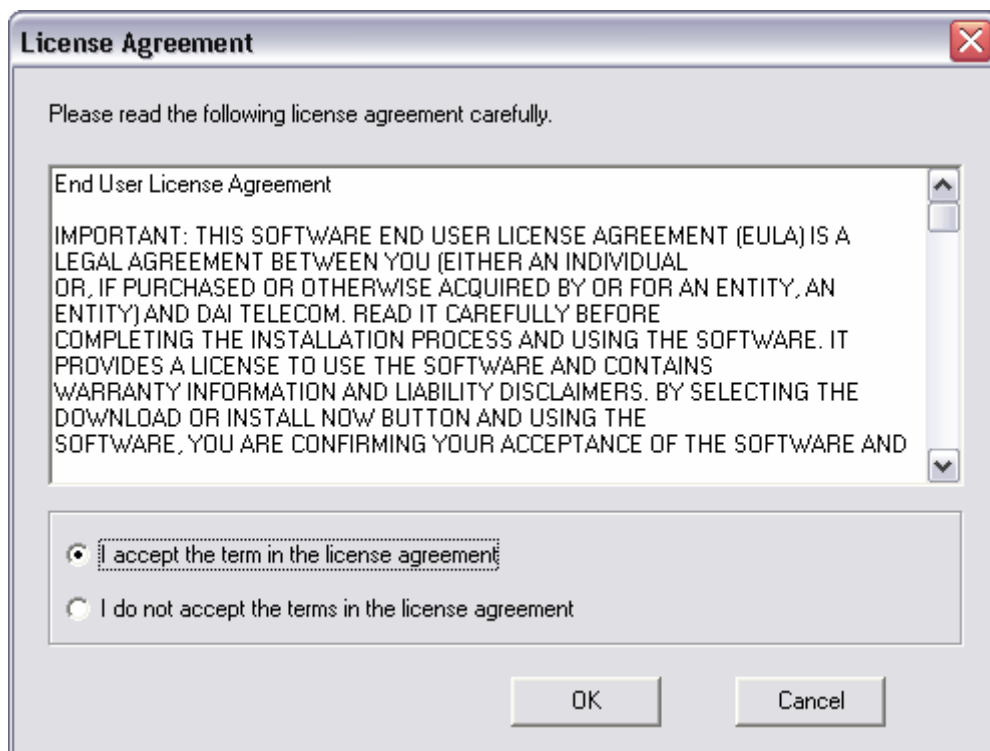
The firmware update can be done with a specific software tool provided by Telit that runs on Windows based PCs.

First the program will erase the content of flash memory, then the program will write on the flash memory. To update the firmware of the module, we suggest the following procedure:

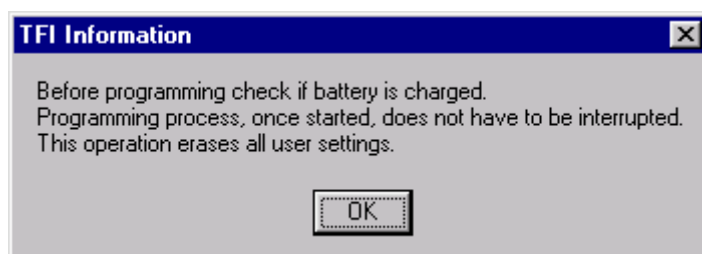
- I. Collect information about the Hardware and implemented version of Software by the command
 - AT+CGMR<enter>, which returns the Software version information;
 - AT+CGMM<enter>, which returns the Model Identification.
- II. Request the specific software for upgrading to Telit Technical Support
- III. Switch off the module
- IV. Mount the [Telit GE864 / GC864 module](#) in the [Evaluation Kit](#) (using the dedicated adaptor) and supply power
- V. Run the file application you received from the Technical Support (e.g. *TFL_GE864.exe*). The following window will be displayed, Select the language preferred by pressing the correspondent button.



- VI. The End User License Agreement will appear. Please, read it and accept the terms if you are going to proceed.

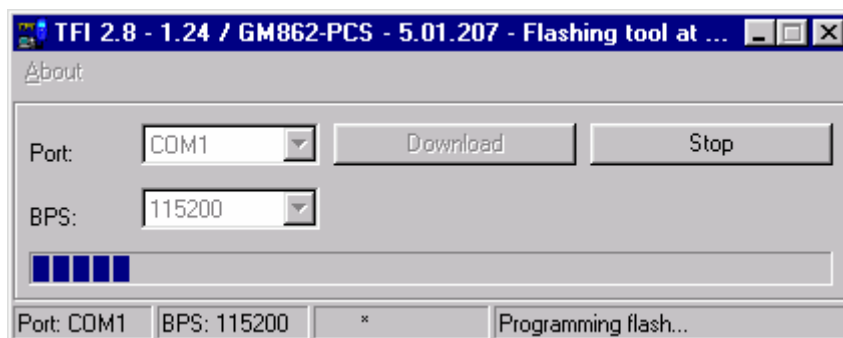


VII. Press OK to the initial message.

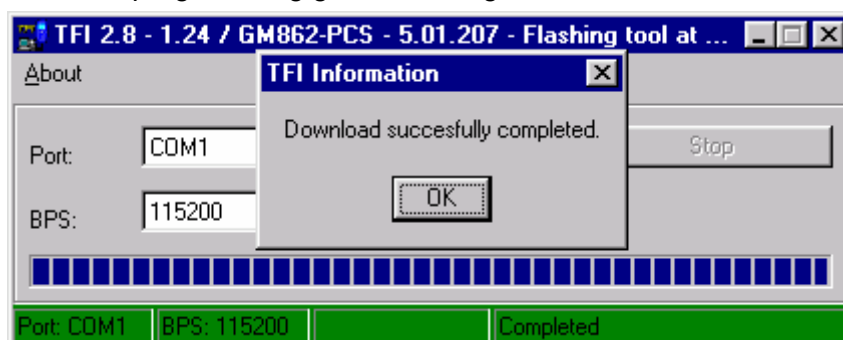


NOTE: the power supply must not be disconnected during the firmware update.

VIII. Select the right COM port and speed. Note that to go faster than 115200 you need a special hardware on the PC. Then Press the Download button and within 5 seconds power-on the GE864 / GC864.



IX. Wait for the end of programming green message OK



The [Telit GE864 / GC864 module](#) is now programmed with the new firmware.

NOTE: the above pictures show how the application dialogs appear for the GM862 product. The GE864 / GC864 TFI application will look similar.

4.2 Update the GE864 firmware on your interface board

In order to allow you to update the GE864 firmware on a module already mounted on the interface board, is mandatory to foresee on the interface board the presence of the following line (Test Point or connector):

- C103/TXD Pin 37
- C104/RXD Pin 38
- ON_OFF Pin 4
- GND line (Pin 28 or 8 or 17 or 36)

Is also recommended to foresee the presence on the interface board of the following line (Test Point or connector):

- TX_TRACE Pin 25
- RX_TRACE Pin 26
- GND line (Pin 28 or 8 or 17 or 36)

5 Software Features

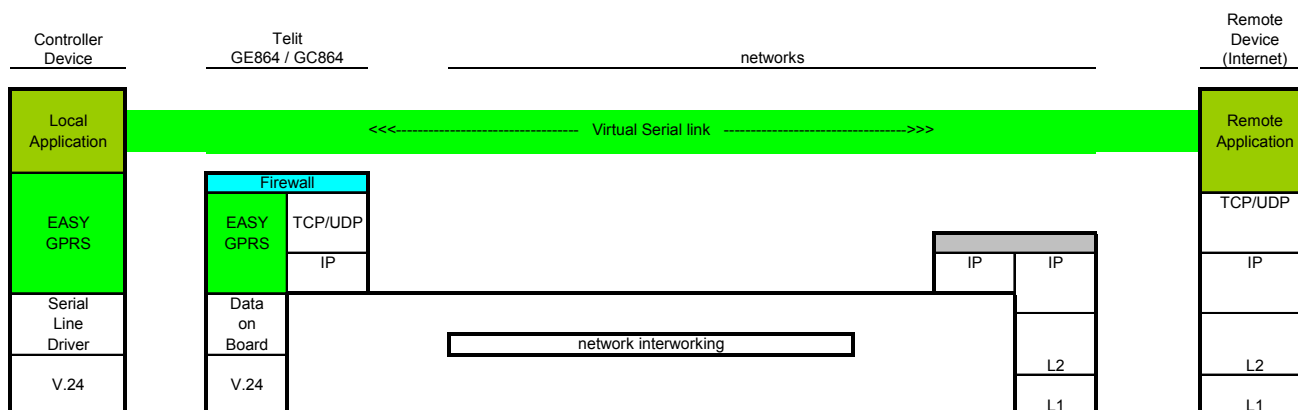
5.1 Enhanced Easy GPRS Extension

5.1.1 Overview

The Easy GPRS feature allows the [Telit GE864 / GC864](#) user to contact a device in internet and establish with it a raw data flow over the GPRS and Internet networks.

This feature can be seen as a way to obtain a "virtual" serial connection between the Application Software on the Internet machine involved and the controller of the [Telit GE864 / GC864](#) module, regardless of all the software stacks underlying.

An example of the protocol stack involved in the devices is reported:



This particular implementation allows to the devices interfacing to the [Telit GE864 / GC864](#) module the use of the GPRS and Internet packet service without the need to have an internal TCP/IP stack since this function is embedded inside the module. The new Enhanced version of the Easy GPRS overcomes some of the known limitations of the previous implementation and implements some new features such as:

- Keep the GPRS context active even after the closing of a socket, allowing the application to keep the same IP address;
- Also Mobile terminated (incoming) connections can be made, now it is possible to receive incoming TCP connection requests;
- A new internal firewall has been implemented in order to guarantee a certain level of security on internet applications.

5.1.2 Easy GPRS definition

The Easy GPRS feature provides a way to replace the need of an Internet TCP/IP stack at the terminal equipment side. The steps that will be required to obtain a virtual serial connection (that is actually a socket) to the Internet peer are:

- a) configuring the GPRS Access
- b) configuring the embedded TCP/IP stack behavior
- c) defining the Internet Peer to be contacted
- d) request the GPRS and socket connections to be opened (host is connected)
- e) exchange raw data
- f) close the socket and GPRS context

All these steps are achieved through AT commands.

As for common modem interface, two logical status are involved: command mode and data traffic mode.

- In Command Mode (CM), some AT commands are provided to configure the Data Module Internet stack and to start up the data traffic.
- In data traffic mode (Socket Mode, SKTM), the client can send/receive a raw data stream which will be encapsulated in the previously configured TCP / IP packets which will be sent to the other side of the network and vice versa. Control plane of ongoing socket connection is deployed internally to the module.

5.1.2.1 Configuring the GPRS access

The GPRS access configuration is done by setting:

- the GPRS context number 1 parameters (see +CGDCONT command)
- the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

5.1.2.2 Configuring the embedded TCP/IP stack

The TCP/IP stack behavior must be configured by setting:

- the packet default size (see command #PKTSZ)
- the data sending timeout (see command #DSTO)
- the socket inactivity timeout (see command #SKTTO)

5.1.2.3 Defining the Internet peer to be contacted

As last setting definition, the host to be contacted and on which port/protocol must be set:

- the socket definition (see command #SKTSET)

-
This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.

If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its

DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.

5.1.2.4 Open the connection with the internet host

With the AT#SKTOP all the process required to connect with the internet host starts:

- GE864 / GC864 activates the first context
- GE864 / GC864 proceeds to the authentication with the parameters specified
- Eventually does the DNS query to resolve the IP address of the host name internet peer
- GE864 / GC864 establishes a TCP/UDP (depending on the parameter request) connection with the given internet host
- Once the connection is up the module reports the code: CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is buffered and flushed to the Terminal Equipment.

5.1.2.5 Close the Socket and deactivate the context

The connection can be closed because of:

- remote host TCP connection close
- socket inactivity timeout
- Terminal Equipment by issuing the escape sequence "+++"
- Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.

The pause time is defined in the parameter S12.

On the reception of an escape sequence the GE864 / GC864 closes the connection, deactivates the GPRS context returning to command mode and issuing the NO CARRIER code.

5.1.3 Enhanced Easy GPRS Outgoing connection

The New Enhanced Easy GPRS feature provides a way to place outgoing TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.

The steps that will be required open a socket and close it without closing the GRPS context are:

- g) configuring the GPRS Access
- h) configuring the embedded TCP/IP stack behavior
- i) defining the Internet Peer to be contacted
- j) request the GPRS context to be activated
- k) request the socket connection to be opened
- l) exchange data
- m) close the TCP connection while keeping the GPRS active

All these steps are achieved through AT commands. As for common modem interface, two logical statuses are involved: command mode and data traffic mode.

- In Command Mode (CM), some AT commands are provided to configure the Data Module Internet stack and to start up the data traffic.
- In data traffic mode (Socket Mode, SKTM), the client can send/receive a raw data stream which will be encapsulated in the previously configured TCP / IP packets which will be sent to the other side of the network and vice versa. Control plane of ongoing socket connection is deployed internally to the module.

5.1.3.1 Configuring the GPRS access

The GPRS access configuration is done by setting:

- the GPRS context number 1 parameters (see +CGDCONT command)
- the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

5.1.3.2 Configuring the embedded TCP/IP stack

The TCP/IP stack behavior must be configured by setting:

- the packet default size (see command #PKTSZ)
- the data sending timeout (see command #DSTO)
- the socket inactivity timeout (see command #SKTTO)

5.1.3.3 Defining the Internet peer to be contacted

As last setting definition, the host to be contacted and on which port/protocol must be set:

- the socket definition (see command #SKTSET)

This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.

If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.

Note that this setting command is not needed if the new #SKTD command is used.

5.1.3.4 Request the GPRS context to be activated

With the new command #GPRS you can activate or deactivate a GPRS context INDEPENDENTLY from the TCP socket opening:

AT#GPRS=1 activates the context,
AT#GPRS=0 deactivates the context

Therefore with the AT#GPRS=1 command the module

- GE864 / GC864 activates the context previously defined with AT+CGDCONT
- GE864 / GC864 proceeds to the authentication with the parameters specified

Note that activating a context implies getting an IP address from the network and this will be maintained throughout the session.

The response code to the AT#GPRS=1 command reports the IP address obtained from the network, allowing the user to report it to his server or application.

Deactivating the context implies freeing the network resources previously allocated to the device.

5.1.3.5 Open the connection with the internet host

With the new command #SKTD (socket Dial) the TCP/UDP request to connect with the internet host starts:

- Eventually does the DNS query to resolve the IP address of the host name internet peer
- GE864 / GC864 establishes a TCP/UDP (depending on the parameter request) connection with the given internet host
- Once the connection is up the module reports the code: CONNECT

Note that the peer specifications of this socket Dial are within the command and not the one stored with #SKTSET command.

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.

In the same manner, when disconnecting the #SKTD command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

5.1.3.6 Close the Socket without deactivating the context

The connection can be closed because of:

- remote host TCP connection close
- socket inactivity timeout
- Terminal Equipment by issuing the escape sequence "+++"
- Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.

The pause time is defined in the parameter S12.

On the reception of an escape sequence if the socket was opened with the AT#SKTD command, the GE864 / GC864 closes the connection, does not deactivate the GPRS context and returns to command mode issuing the NO CARRIER code.

5.1.4 Enhanced Easy GPRS Incoming Connection

The New Enhanced Easy GPRS feature provides a way to accept incoming TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.

The steps that will be required to open a socket in listen, waiting for connection requests from remote hosts and accept these request connections only from a selected set of hosts, then close it without closing the GPRS context are:

- a) Configuring the GPRS Access
- b) Configuring the embedded TCP/IP stack behavior (see par. 5.1.3.2)
- c) Defining the Internet Peer that can contact this device (firewall settings) (see par. 5.1.4.1)
- d) Requesting the GPRS context to be activated (see par. 5.1.3.4)
- e) Request the socket connection to be opened in listen (see par. 5.1.4.2)
- f) Receive connection requests (see par. 5.1.4.3)
- g) exchange data
- h) Close the TCP connection while keeping the GPRS active (see par. 5.1.3.6)

All these steps are achieved through AT commands.

As for common modem interface, two logical statuses are involved: command mode and data traffic mode.

- In Command Mode (CM), some AT commands are provided to configure the Data Module Internet stack and to start up the data traffic.
- In data traffic mode (Socket Mode, SKTM), the client can send/receive a raw data stream which will be encapsulated in the previously configured TCP / IP packets which will be sent to the other side of the network and vice versa. Control plane of ongoing socket connection is deployed internally to the module.

5.1.4.1 Defining the Internet Peer that can contact this device (firewall settings)

The GE864 / GC864 have an internal Firewall that controls the behavior of the incoming connections to the module.

The firewall applies for INCOMING (listening) connections; OUTGOING connections will be always done regardless of the firewall settings.

Firewall General policy is DROP, therefore all packets that are not included into an ACCEPT chain rule will be silently discarded.

When a packet incomes from the IP address <incoming IP>, the firewall chain rules will be scanned for matching with the following criteria:

$$\text{<incoming IP> \& \<net mask> = \<ip_address> ?}$$

if the result is yes, then the packet is accepted and the rule scan is finished, otherwise the next chain is taken into account until the end of the rules when the packet is silently dropped if no matching was found.

For example, let assume we want to accept connections only from our devices which are on the IP addresses ranging from:

197.158.1.1 to 197.158.255.255

We need to add the following chain to the firewall:

AT#FRWL=1,"197.158.1.1","255.255.0.0"

5.1.4.2 Request the socket connection to be opened in listen

With the new command #SKTL (socket Listen) the TCP request to start listening for connection requests is executed:

- GE864 / GC864 opens a listening socket on the port specified, waiting for incoming TCP connections (depending on the parameter request) with the internet hosts

The parameters that shall be specified are the local port where packets shall be received, the type of socket and the closing behavior.

5.1.4.3 Receiving connection requests

Once the connection request is received, the module reports an indication of connection with an unsolicited code

+CONN FROM: <remote address>

- then connection is accepted and once it is up the module reports the code:
CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

Note that the connections request are FIRST screened in the firewall, then if they are accepted they pass to the listening socket; therefore only hosts that are in the ACCEPT chain rules of the firewall can induce a connection request, the other host requests will be silently discarded without any indication to the remote host (for security reasons).

Once the connection is received and closed, the socket is not anymore in listen. If the application needs again to be in listen, then it shall send again the socket listen #SKTL command.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.

In the same manner, when disconnecting the #SKTL command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

5.1.4.4 Known limitations

The implementation of the EASY GPRS feature has the following known limitations:

- Only one socket can be opened at a time, no multiple socket connections can be made;
- Only one connection request can be accepted at a time, subsequent requests will be silently discarded.
- Only the first GPRS context is associated with this feature;
- It is taken for granted that external processor will be able to handle at least a limited v.24 implementation: RTS, CTS and, highly recommended, DCD lines; this because software flow control is not applicable to the feature;
- Due to the particularity of this feature, the flow control of both the directions uplink and downlink is interlocked

5.2 Jammed Detect & Report Extension

5.2.1 Overview

The Jammed Detect & Report feature allows a [Telit GE864 / GC864](#) to detect the presence of a disturbing device such as a Communication Jammer and give indication to the user and/or send a report of that to the network.

This feature can be very important in alarm, security and safety applications that rely on the module for the communications. In these applications, the presence of a Jammer device can compromise the whole system reliability and functionality and therefore shall be recognized and reported either to the local system for countermeasure actions or to the network providing remote actions.

An example scenario could be an intrusion detection system that uses the module for sending the alarm indication for example with an SMS to the system owner, and a thief income using a Jammer to prevent any communication between the GSM module and the network.

In such a case, the module detects the Jammer presence even before the break in and can trigger an alarm siren, other communication devices (PSTN modem) or directly report this condition to the network that can provide further security services for example sending SMS to the owner or police. Obviously this last service depends also from network infrastructure support and it may not be supported by some networks.

5.3 Easy Script Extension - Python interpreter

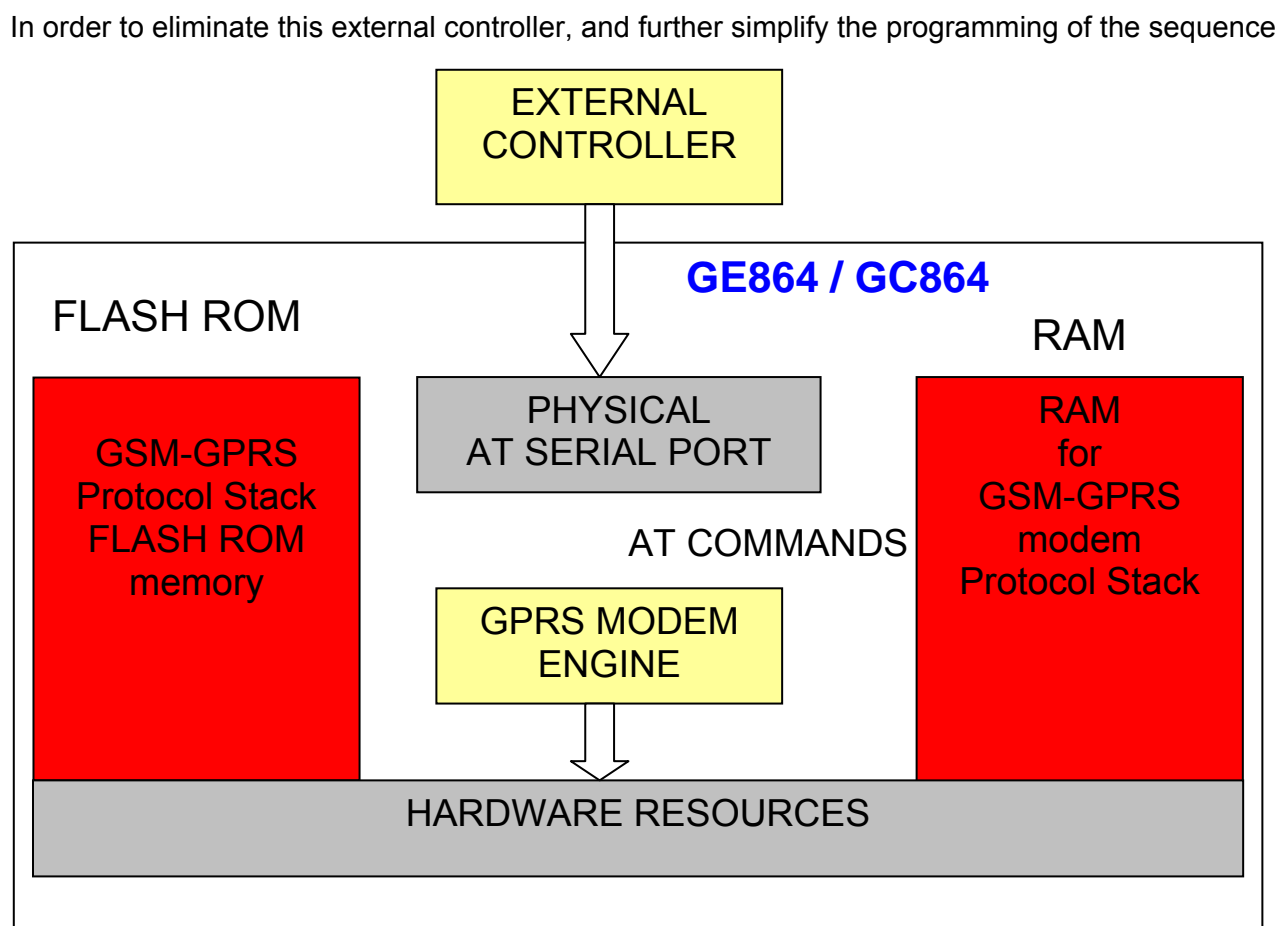
5.3.1 Overview

This feature is available only on the [Telit GE864-PY and GC864-PY](#).

The Easy Script Extension is a feature that allows driving the modem "internally" writing the controlling application directly in a nice high level language: Python.

The Easy Script Extension is aimed at low complexity applications where the application was usually done by a small microcontroller that managed some I/O pins and the GE864-PY and GC864-PY through the AT command interface.

A schematic of such a configuration can be:

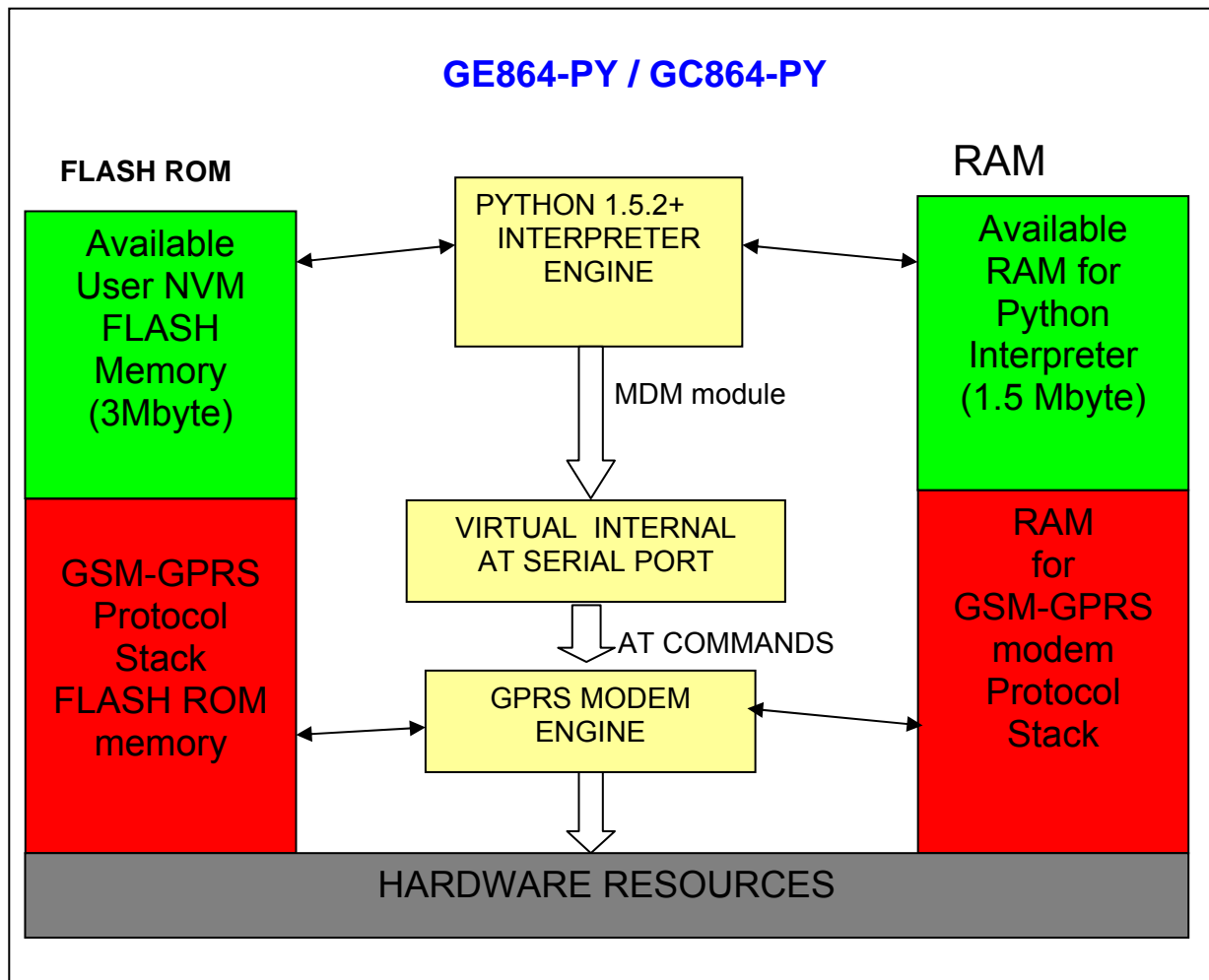


of operations, inside the GE864 / GC864-PY it is included:

- ***Python script interpreter engine v. 1.5.2+***
- ***around 3MB of Non Volatile Memory room for the user scripts and data***

- **1.5 MB RAM reserved for Python engine usage**

A schematic of this approach is:



5.3.2 Python 1.5.2+ Copyright Notice

The Python code implemented into the GE864-PY is copyrighted by Stichting Mathematisch Centrum, this is the license:

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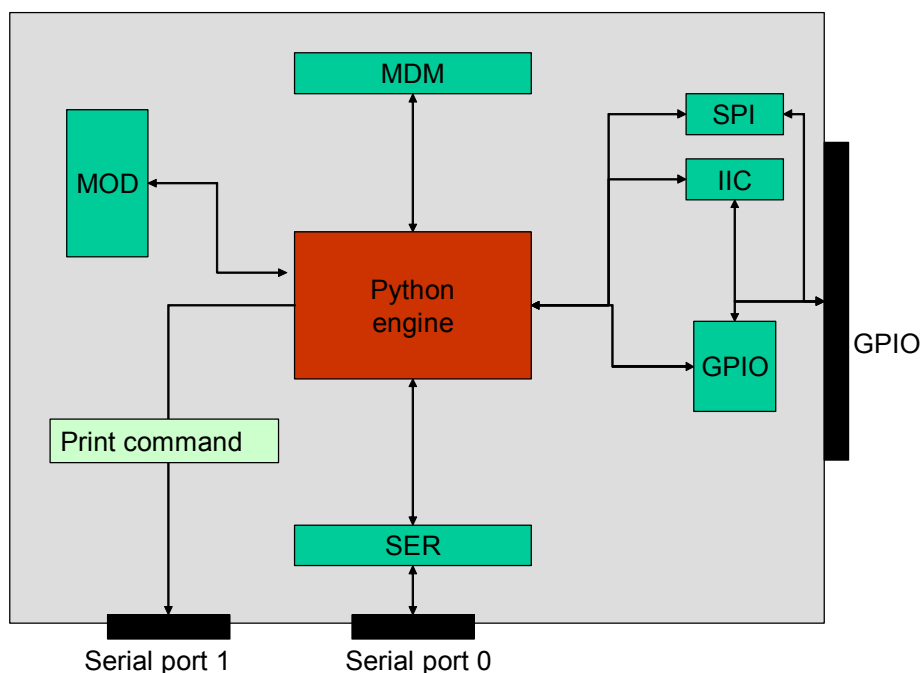
5.3.3 Python implementation description

Python scripts are text files; it is possible to run one Python script in the **Telit GE864-PY / GC864-PY**.

The Python script is stored in NVM memory inside the module. Moreover, there is a file system inside the module that allows to write and read files with different names on one single level (no subdirectories are supported).

The Python script is executed in a task inside the Telit GE864 / GC864 at the lowest priority, making sure this does not interfere with GPRS/GSM normal operations. This allows serial ports, protocol stack etc. to run independently from the Python script.

The Python script interacts with the Telit GE864 / GC864 functionality through four build-in interfaces.



The MDM interface is the most important one. It allows Python script to send AT commands, receive responses and unsolicited indications, send data to the network and receive data from the network during connections.

It is quite the same as the usual serial port interface in the Telit GE864 / GC864. The difference is that this interface is not a real serial port but just an internal software bridge between Python and mobile internal AT command handling engine.

All AT commands working in the Telit GE864 / GC864 are working in this software interface as well. Some of them have no meaning on this interface, such as those regarding serial port settings. The usual concept of flow control keeps its meaning over this interface, but it's managed internally. The SER interface allows Python script to read from and write to the REAL, physical serial port where usually the AT command interface resides, for example to read NMEA information from a GPS device. When Python is running this serial port is free to be used by Python script because it is not used as AT command interface since the AT parser is mapped into the internal virtual serial port. No flow control is available from Python on this port.

The GPIO interface allows Python script to handle general purpose input output faster than through AT commands, skipping the command parser and going directly to control the pins.

The MOD interface is a collection of useful functions.

For the debug, the print command is directly forwarded on the EMMI TX pin (second serial port) at 9600 baud 8N1.

5.3.4 Python core supported features

The Python core version is 1.5.2+ (string methods added to 1.5.2).

You can use all Python statements and almost all Python built-in types and functions.

The following are not supported:

complex; ***float;*** ***long;*** ***docstring.***

Available modules are

marshal, ***imp,*** ***__main__,*** ***__builtin__,*** ***sys***
md5

All the others are not supported.

5.3.5 Python Build-in Custom Modules

Several build in custom modules have been included in the python core, specifically aimed at the hardware environment of the module.

The build in modules included are:

MDM: interface between Python and mobile internal AT command handling;

SER: interface between Python and mobile internal serial port ASC0 direct handling;

GPIO: interface between Python and mobile internal general purpose input output direct handling;

MOD: interface between Python and mobile miscellaneous functions.

IIC: custom software Inter IC bus that can be mapped on creation over almost any GPIO pin available.

SPI: custom software Serial Protocol Interface bus that can be mapped on creation over almost any GPIO pin available.

More details about the Python modules are available in the reference guide.

5.4 AT Commands

The **Telit GE864 / GC864 module** can be driven via the serial interface using the standard AT commands¹.

The **Telit GE864 / GC864 module** is compliant with:

1. Hayes standard AT command set, in order to maintain the compatibility with existing SW programs.
2. ETSI GSM 07.07 specific AT command and GPRS specific commands.
3. ETSI GSM 07.05 specific AT commands for SMS (Short Message Service) and CBS (Cell Broadcast Service)
4. FAX Class 1 compatible commands

Moreover the **Telit GE864 / GC864 module** supports also Telit proprietary AT commands for special purposes.

The following table lists all supported AT commands and related brief description.

Hayes Compliant AT Commands		At Commands availability for GE864, GC864 models:	
Generic Modem Control		QUAD	PY
&F	Reset base section factory profile configuration	•	•
&F1	Reset full factory profile configuration	•	•
Z	Soft reset	•	•
+FCLASS	Select active service class	•	•
&Y	Designate a default reset basic profile	•	•
&P	Designate a default reset full profile	•	•
&W	Store current configuration	•	•
&Z	Store telephone number in the internal phonebook	•	•
&N	Display internal phonebook stored numbers	•	•
+GMI	Request manufacturer identification	•	•
+GMM	Request model identification	•	•
+GMR	Request revision identification	•	•
+GCAP	Request capabilities list	•	•
+GSN	Request serial number	•	•
&V	Display current configuration & profile	•	•
&V0	Display current configuration & profile	•	•
&V1	Display S registers values	•	•
&V2	Display last connection statistics	•	•
&V3	Display S registers values	•	•
\V	Single line connect message	•	•
%L	Report line signal level	•	•
%Q	Report line quality	•	•
+GCI	Select the country of installation	•	•
L	Monitor speaker loudness	•	•
M	Monitor speaker mode	•	•

¹ The AT is an ATTENTION command and is used as a prefix to other parameters in a string. The AT command combined with other parameters can be set up in the communications package or typed in manually as a command line instruction.

DTE - modem interface control		QUAD	PY
E	Command echo	•	•
Q	Quiet result codes	•	•
V	Result code form	•	•
X	Extended result codes	•	•
I	Request identifier and software checksum	•	•
&C	Data carrier detect (DCD) control	•	•
&D	Data terminal ready (DTR) control	•	•
&K	Flow control	•	•
&Q	Sync/async mode	•	•
&S	Data set ready (DSR) control	•	•
\R	Ring (RI) control	•	•
+IPR	Fixed DTE interface rate	•	•
+IFC	DTE - DTA flow control	•	•
+ILRR	DTE - modem rate reporting	•	•
+ICF	DTE - modem character format	•	•
Call Control		QUAD	PY
D	Dial	•	•
T	Set tone dial	•	•
P	Set pulse dial	•	•
A	Answer	•	•
A/	Last command automatic repetition	•	•
H	Disconnect	•	•
O	Return to On Line Mode	•	•
&G	Guard tone	•	•
Modulation control		QUAD	PY
+MS	Modulation control	•	•
%E	Enable/disable line quality monitor and auto retrain or fallback / fallforward	•	•
\N	Operating mode	•	•
Compression control		QUAD	PY
+DS	Set data compression	•	•
+DR	Data compression reporting	•	•
Break control		QUAD	PY
\B	Transmit break to remote	•	•
\K	Break handling	•	•
S parameters		QUAD	PY
S0	Number of rings to auto answer	•	•
S1	Ring counter	•	•
S2	Escape character	•	•
S3	Carriage return character	•	•
S4	Line feed character	•	•
S5	Backspace character	•	•
S7	Wait time for carrier, silence or dial tone	•	•
S12	Escape prompt delay	•	•
S25	Delay to DTR off	•	•
S30	Disconnect inactivity timer	•	•
S38	Delay before forced hang up	•	•
ETSI GSM 07.07 AT Commands		QUAD	PY
+CGMI	Request manufacturer identification	•	•
+CGMM	Request model identification	•	•
+CGMR	Request revision identification	•	•
+CGSN	Request product serial number identification	•	•
+CSCS	Select TE character set	•	•
+CIMI	Request international mobile subscriber identity (IMSI)	•	•

Call control		QUAD	PY
+CBST	Select bearer service type	•	•
+CRLP	Radio link protocol	•	•
+CR	Service reporting control	•	•
+CEER	Extended error report	•	•
+CRC	Cellular result codes	•	•
+CSNS	Single numbering scheme	•	•
Network service handling		QUAD	PY
+CNUM	Subscriber number	•	•
+COPN	Read operator names	•	•
+CREG	Network registration report	•	•
+COPS	Operator selection	•	•
+CLCK	Facility lock/ unlock	•	•
+CPWD	Change facility password	•	•
+CLIP	Calling line identification presentation	•	•
+CLIR	Calling line identification restriction	•	•
+CCFC	Call forwarding number and conditions	•	•
+CCWA	Call waiting	•	•
+CHLD	Call holding services	•	•
+CUSD	Unstructured supplementary service data	•	•
+CAOC	Advice of charge	•	•
+CLCC	List current calls	•	•
+CSSN	SS Notification	•	•
+CCUG	Closed User Group supplementary service control	•	•
Mobile Equipment control		QUAD	PY
+CPAS	Phone activity status	•	•
+CFUN	Set phone functionality (Power Saving Management)	•	•
+CPIN	Enter PIN	•	•
+CSQ	Signal quality	•	•
+CPBS	Select phonebook memory storage	•	•
+CPBR	Read phonebook entries	•	•
+CPBF	Find phonebook entries	•	•
+CPBW	Write phonebook entry	•	•
+CCLK	Clock Management	•	•
+CALA	Alarm Management	•	•
+CALM	Alert sound mode	•	•
+CRSL	Ringer sound level	•	•
+CLVL	Loudspeaker volume level	•	•
+CMUT	Microphone mute control	•	•
+CACM	Accumulated call meter	•	•
+CAMP	Accumulated call meter maximum	•	•
+CPUC	Price per unit and currency table	•	•
+CCID	Read ICCID (Integrated Circuit Card Identification)	•	•
Mobile equipment errors		QUAD	PY
+CMEE	Report mobile equipment error	•	•
Voice Control (TIA IS-101)		QUAD	PY
+VTS:	DTMF tones transmission	•	•
Commands For GPRS		QUAD	PY
+CGACT	PDP context activate or deactivate	•	•
+CGATT	GPRS attach or detach	•	•
+CGDATA	Enter data state	•	•
+CGDCONT	Define PDP context	•	•
+CGPADDR	Show PDP address	•	•
+CGREG	GPRS network registration status	•	•
+CGQMIN	Quality of service profile (minimum acceptable)	•	•

+CGQREQ	Quality of service profile (requested)	•	•
Commands For Battery Charger		QUAD	PY
+CBC	Battery Charge	•	•
ETSI GSM 07.05 AT Commands for SMS and CB services		QUAD	PY
+CSMS	Select message service	•	•
+CPMS	Preferred message storage	•	•
+CMGF	Message format	•	•
+CSMP	Set parameters in text mode	•	•
+CSDH	Show parameters in text mode	•	•
+CSAS	Save setting text mode	•	•
+CRES	Restore text mode settings	•	•
+CSCB	Select Cell Broadcast Message types	•	•
Message configuration		QUAD	PY
+CSCA	Service center address	•	•
Message receiving and reading		QUAD	PY
+CNMI	New message indications to Terminal Equipment	•	•
+CMGL	List messages	•	•
+CMGR	Read message	•	•
Message sending and writing		QUAD	PY
+CMGS	Send message	•	•
+CMSS	Send message from storage	•	•
+CMGW	Write message to memory	•	•
+CMGD	Delete message	•	•
Custom AT Commands		QUAD	PY
#CGMI	Request manufacturer identification	•	•
#CGMM	Request model identification	•	•
#CGMR	Request revision identification	•	•
#CGSN	Request product serial number identification	•	•
#CIMI	Request international mobile subscriber identity (IMSI)	•	•
#CAP	Change Audio Path	•	•
#SRS	Select ringer sound	•	•
#SRP	Select Ringer Path	•	•
#STM	Signalling Tones Mode	•	•
#PCT	Display PIN Counter	•	•
#SHDN	Software Shut Down	•	•
#WAKE	Wake from Alarm mode	•	•
#QTEMP	Query Temperature overflow	•	•
#SGPO	Set General Purpose Output	•	•
#GGPI	Read General Purpose Input	•	•
#GPIO	General Purpose Input/Output pin control	•	•
#ADC	Read Analog/Digital Converter Input	•	•
#VAUX	Auxiliary Voltage Output Control	•	•
#MONI	Monitor Cells	•	•
#QSS	Query SIM Status	•	•
#ACAL	Set Automatic Call	•	•
#SMOV	SMS Overflow	•	•
#SHFEC	Set Handsfree echo canceller	•	•
#HFMICG	Handsfree Microphone Gain	•	•
#HSMICG	Handset Microphone Gain	•	•
#SHFSD	Set Handsfree side tone	•	•
#/	Repeat last command	•	•
#NITZ	Network Timezone	•	•
#BND	Select Band	•	•
FTP CLIENT AT Commands		QUAD	PY
#FTPOPEN	FTP Open command	•	•

#FTPCLOSE	FTP Close command	•	•
#FTPPUT	FTP Put command	•	•
#FTPGET	FTP Get command	•	•
#FTPTYPE	FTP Type command	•	•
#FTPMSG	FTP read message command	•	•
#FTPDELE	FTP Delete command	•	•
#FTPPWD	FTP print working directory command	•	•
#FTPCWD	FTP change working directory command	•	•
#FTPLIST	FTP List command	•	•
FAX Class 1 Commands		QUAD	PY
+FCLASS	Select active service class	•	•
+FMI	Report manufacturer ID	•	•
+FMM?	Report model ID	•	•
+FMR	Report revision ID	•	•
Transmission/Reception control		QUAD	PY
+FTS	Stop Transmission and pause	•	•
+FRS	Wait for receive silence	•	•
+FTM	Transmit data modulation	•	•
+FRM	Receive data modulation	•	•
+FTH	Transmit data with HDLC framing	•	•
+FRH	Receive data with HDLC framing	•	•
Serial port control		QUAD	PY
+FLO	Select flow control specified by type	•	•
+FPR	Select serial port rate	•	•
+FDD	Double escape character replacement control	•	•
Enhanced Easy GPRS custom AT command Definition		QUAD	PY
#USERID	Authentication User ID control	•	•
#PASSW	Authentication Password control	•	•
#PKTSZ	Packet Size control	•	•
#DSTO	Data Sending TimeOut control	•	•
#SKTTO	Socket inactivity timeout control	•	•
#SKTSET	Socket definition control	•	•
#SKTOP	Socket Open command	•	•
#QDNS	Query DNS	•	•
#SKTCT	Socket TCP Connection Timeout	•	•
#SKTSAV	Socket Parameters Save Command	•	•
#SKTRST	Socket Parameters Reset Command	•	•
#GPRS	GPRS context activation control	•	•
#SKTD	Socket Dial	•	•
#SKTL	Socket Listen	•	•
#FRWL	Firewall setup	•	•
Easy Camera Extension - Camera Management		QUAD	PY
#CAMON	Camera ON	•	•
#CAMOFF	Camera OFF	•	•
#TPHOTO	Camera Take Photo	•	•
#RPHOTO	Camera Read Photo	•	•
#OBJL	Object List	•	•
#OBJR	Object Read	•	•
#CAMQUA	Camera Select Quality of Photo	•	•
#CMODE	Camera Select Operating MODE	•	•
Email management		QUAD	PY
#ESMTP	Email SMTP server	•	•
#EADDR	Email sender address	•	•
#EUSER	Email authentication USER NAME	•	•
#EPASSW	Email authentication PASSWORD	•	•

#SEMAIL	Send Email	•	•
#EMAILACT	E-mail context activation control	•	•
#EMAILD	E-mail socket dial	•	•
#ESAV	Email Parameters Save Command	•	•
#ERST	Email Parameters Reset Command	•	•
Easy Scan Extension		QUAD	PY
#CSURV	Network Survey of the complete 900/1800/1900 Network	•	•
#CSURVC	Network Survey in computer friendly format	•	•
#CSURVU	Network Survey of user defined 900/1800/1900 chan.	•	•
#CSURVUC	Network Survey in computer friendly format	•	•
#CSURVF	Network Survey Format	•	•
Jammed Detect & Report custom AT command		QUAD	PY
#JDR	Jammed Detect & Report	•	•
PYTHON Script Management commands		QUAD	PY
#WSCSCRIPT	Write script command		•
#ESCRSCRIPT	Select Active script command		•
#RSCRIPT	Read script command		•
#LSCRIPT	List script names command		•
#DSCRIPT	Delete script command		•
#REBOOT	Reboot command		•

6 Conformity Assessment Issues

The [Telit GE864](#) and [GC864](#) are assessed to be conform to the R&TTE Directive.

If the antenna connected to the module is conforming to the requirements specified under this document, it requires no further evaluation under **Article 3.2** of the R&TTE Directive and do not require further involvement of a R&TTE Directive Notified Body for the final product.

In all other cases, or if the manufacturer of the final product is in doubt then the equipment integrating the radio module must be assessed against **Article 3.2** of the R&TTE Directive.

In all cases assessment of the final product must be made against the Essential requirements of the R&TTE Directive **Articles 3.1(a)** and **(b)**, safety and EMC respectively, and any relevant **Article 3.3** requirements.

The [Telit GE864](#) and [GC864](#) are conform with the following European Union Directives:

- ☐ R&TTE Directive 1999/5/EC (Radio Equipment & Telecommunications Terminal Equipments)
- ☐ Low Voltage Directive 73/23/EEC and product safety
- ☐ Directive 89/336/EEC for conformity for EMC

In order to satisfy the essential requisite of the R&TTE 99/5/EC directive, the GE864 module is compliant with the following standards:

- ☐ GSM (Radio Spectrum). Standard: EN 301 511 and 3GPP 51.010-1
- ☐ EMC (Electromagnetic Compatibility). Standards: EN 301 489-1 and EN 301 489-7
- ☐ LVD (Low Voltage Directive) Standards: EN 60 950

In this document and the Hardware User Guide, Software User Guide all the information you may need for developing a product meeting the R&TTE Directive is included.

Furthermore the [Telit GE864 / GC864 module](#) is FCC Approved as module to be installed in other devices. This device is to be used only for fixed and mobile applications. If the final product after integration is intended for portable use, a new application and FCC is required.

The [Telit GE864 / GC864](#) is conforming with the following US Directives:



- Use of RF Spectrum. Standards: FCC 47 Part 24 (GSM 1900)
- EMC (Electromagnetic Compatibility). Standards: FCC47 Part 15

To meet the FCC's RF exposure rules and regulations:

- The system antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- The system antenna(s) used for this module must not exceed 3 dBi for mobile and fixed or mobile operating configurations.
- Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.

6.1 GE864-QUAD Conformity Assessment

	DECLARATION OF CONFORMITY
We, Telit Communications S.p.A	
Of: Via Stazione di Prosecco, 5/b 34010 Sgonico (TRIESTE) ITALY	
declare under our sole responsibility that the product GE864-QUAD	
to which this declaration relates is in conformity with all the essential requirements of Directive 1999/05/EC	
The conformity with the essential requirements of the European Directive 1999/05/EC has been verified against the following harmonized standards:	
<ul style="list-style-type: none">• ETSI EN 301 511 Mobile stations in GSM 900 and DCS1800;• CENELEC EN 60950 Safety of information technology equipments;• ETSI EN 301 489-7 EMC&ERM Specific for GSM and DCS telecommunications systems.	
The conformity assessment procedure referred to in Article 10 and detailed in Annex IV of Directive 1999/5/EC has been followed with the involvement of the following Notified Body:	
BABT, Balfour House, Churchfield Road, Walton-on-Thames, Surrey, KT12 2TD, United Kingdom	
Identification mark:	0168
The technical documentation relevant to the above equipment will be held at:	
Telit Communications S.p.A Via Stazione di Prosecco, 5/b 34010 Sgonico (TRIESTE) ITALY	
Trieste, 08 february 2006	 Ing. Guido Walcher Quality Assurance Director
06DOC04 MOD.003 02/06 REV.9	

ZERTIFIKAT • CERTIFICATE • 認証証書 • CERTIFICADO • CERTIFICAT



Certificate

This certificate is issued to

TELIT Communications S.p.A.

of

Viale Stazione di Prosecco 5/B
34010 Sgonico
Trieste
Italy

to certify that the Equipment known as

GE864-QUAD

as described in the Annex to this certificate
conforms to the essential requirements of Directive 1999/5/EC
of the European Parliament and European Council on the basis
of Technical Construction File number 22345_GE864-QUAD_rev1
in relation to the essential requirements of
Articles 3.1(a), 3.1(b) & 3.2 of the Directive.

Signed:


On Behalf of BABT

Issue Date: 08 February 2006

Number: NC/12659 Issue: 01

This certificate is issued by BABT and represents a formal Notified Body opinion under Annex IV of Directive 1999/5/EC
permitting the use of the BABT 00168 mark on the equipment described above
subject to the equipment meeting the compliance requirements of all applicable EU directives.
This certificate is not transferable and remains the property of BABT.

British Approvals Board for Telecommunications • TÜV SÜD Group •
Balfour House • Churchfield Road • Walton-on-Thames • Surrey • KT12 2TD • United Kingdom





Annex to

CERTIFICATE

Description of Equipment

Quad band GSM850, GSM900, DCS1800, PCS1900 GPRS Cellular Mobile Radio module.

Standards

Compliance has been demonstrated with:

EN 60950-1:2001
EN 301 489-7: v1.2.1
EN 301 511 V.9.0.2

Network Interface compatibility

Antenna	The Global System Mobila (GSM) 900 Network
	The DCS 1800 Personal Communications Network (PCN)

Relevant Technical Documentation

Supplier's Declaration(s) of Conformity: R&TTE draft 08/02/06

User Guides:

Telit GE864 Hardware User Guide
1vv0300694, Rev. ISSUE#2, - 19/12/05

Technical Manual 1vv0300661 Rev.1



Test report number: RF Cetecom 22345RTC.001
Telit 31669
EMC Cetecom 22345REM.001
Safety Cetecom 22345RSE.001

Approved Software for GM864-QUAD		
Title	Identifier	Revision Level
GM864-QUAD	N/a	PS:05.03.02 / AL:7.01.002-B13-GE864-QUAD

Approved Hardware for GM864-QUAD Hardware version 1.00		
Printed circuit board	Schematic	Bill of materials
CS1134A	30273SE11134A	25.05.05 code: 2000100701

Signed: <u>Alan Buils</u> on behalf of BABT	Date: 8 February 2006
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7 SAFETY RECOMMENDATIONS

READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- ☐ Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc
- ☐ Where there is risk of explosion such as gasoline stations, oil refineries, etc

It is responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming to the security and fire prevention regulations.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force.

Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (20 cm). In case of this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The European Community provides some Directives for the electronic equipments introduced on the market. All the relevant information's are available on the European Community website:

<http://europa.eu.int/comm/enterprise/rte/dir99-5.htm>

The text of the Directive 99/05 regarding telecommunication equipments is available, while the applicable Directives (Low Voltage and EMC) are available at:

http://europa.eu.int/comm/enterprise/electr_equipment/index_en.htm

8 GE864 and GC864 Technical Support

Telit's technical support to [GE864](#) and [GC864](#) wireless modems customers consists in:

- Technical documentation: available for download into the Website www.telit.com >Products >Modules > selected model.
- Engineering support: accessible via E-Mail service with 48 hr replies assured under normal conditions.

9 List of acronyms

ACM	Accumulated Call Meter
ASCII	American Standard Code for Information Interchange
AT	Attention commands
CB	Cell Broadcast
CBS	Cell Broadcasting Service
CCM	Call Control Meter
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CMOS	Complementary Metal-Oxide Semiconductor
CR	Carriage Return
CSD	Circuit Switched Data
CTS	Clear To Send
DAI	Digital Audio Interface
DCD	Data Carrier Detected
DCE	Data Communications Equipment
DRX	Data Receive
DSR	Data Set Ready
DTA	Data Terminal Adaptor
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTR	Data Terminal Ready
EMC	Electromagnetic Compatibility
ETSI	European Telecommunications Equipment Institute
FTA	Full Type Approval (ETSI)
GPRS	General Radio Packet Service
GSM	Global System for Mobile communication
HF	Hands Free
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IRA	Internationale Reference Alphabet
ITU	International Telecommunications Union
IWF	Inter-Working Function
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Linefeed
ME	Mobile Equipment
MMI	Man Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
OEM	Other Equipment Manufacturer
PB	Phone Book
PDU	Protocol Data Unit
PH	Packet Handler
PIN	Personal Identity Number
PLMN	Public Land Mobile Network

PUCT	Price per Unit Currency Table
PUK	PIN Unblocking Code
RACH	Random Access Channel
RLP	Radio Link Protocol
RMS	Root Mean Square
RTS	Ready To Send
RI	Ring Indicator
SCA	Service Center Address
SIM	Subscriber Identity Module
SMD	Surface Mounted Device
SMS	Short Message Service
SMSC	Short Message Service Center
SS	Supplementary Service
TIA	Telecommunications Industry Association
UDUB	User Determined User Busy
USSD	Unstructured Supplementary Service Data

10 Document Change Log

Revision	Date	Changes
DRAFT #0		Draft for comments
DRAFT #1	23/06/2005	Updated Para 2.16 Interfaces on GE864 and Pins allocation Added BGA Balls layout Updated Para 2.17 Updated Para 2.18 Updated Para 3
DRAFT #2	04/08/2005	1 Overview: updated 2.3 Environmental requirements: changed 2.6 reference sensitivity: updated 2.16: Interfaces on GE864 and Pins allocation: changed 2.17 with all info regarding the soldering process: changed Disclaimer: added Safety Recommendation: added AT commands Availability table: added
ISSUE #3	25/01/2006	GC864 drawings and size: added GC864 Antenna connector: added RF Transmission Monitor: added DAC Converter: changed GE864 balls allocation: E10 ball now reserved GC864 pins allocation: added Mounting the GC864 on your board: added Conformity assessment Issues: changed GE864-QUAD Conformity assessment: added Safety Recommendations: changed GE864 and GC864 Technical Support: changed